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Crystal Raider

Reviewed by Chris Bay

The object of the game is to collect all the quartz crystals in a complex of over 50 rooms. Why? Because if you don't you'll be dead, that's why! You start with five lives and one is lost every time you are caught by a monster or you don't complete the room quickly enough and run out of oxygen. However, you do gain a life if you completely clear a room of crystals and move on to the next. The game is of the standard 'platform' type in which you must figure out the correct route to achieve your goal of clearing each room. These types of games are always entertaining and *Crystal Raider* is no exception. In fact, it has one feature which makes it different from the rest. You can play *Crystal Raider* at night! No, not when it is dark outside your window, but when you select night-time play and eventually the whole screen goes black and your man is illuminated in a small yellow 'window' of his own. Playing the game is then much more difficult and puts it into the ranks of one of the best around.

Crystal Raider is marketed by Mastertronic, costs £1.99 and is available only on cassette as part of their budget range. This puts it well within the grasp of youngsters, pocket money and is therefore assured of doing well.

Domain of the Undead

Reviewed by Brad Mounsey

In this game it is your unlikely task to have to venture into the morbid graveyard to retrieve the master keys. Unfortunately the full moon's glow on the greenstones makes the skeletons, spiders and other nasties rise up and chase you. You do have some protection in the form of Anti-specter bolts which you fire at the ghouls. In addition to having four creatures to ward off, as well as fending off the ghouls, you also have to contend with the vampire bats, flying skeletons, lightning, gargoyles and claws that come up out of the ground on you.

On booting up the game you are thrust to a graveyard scene with a musical intro which is a little bit on the long side, but not unpleasant to listen to in a morbid sort of way. Then it into the game proper. The directions are fairly well done, but the rest of the graphics won't win any awards. The colours are very dark and somber which doesn't help, but then what do you expect in the middle of a graveyard at dead of night?

Domain of the Undead is priced at £3.95 for disk or £7.95 for cassette. Although not the best from Red Rat Software, it is far from being bad and I am sure many who like this type of shoot-out game will find it great fun. Not a classic, but good entertainment and sure to keep Red Rat's reputation for quality games intact.

Molecule Man

Reviewed by Chris Bay

You are the Molecule Man and you must make your way around the 3D maze trying to escape from the deadly radiation before it ends at your home. Somewhere in the maze is a Teleporter which will transport you to freedom, however it seems to be broken. You must find 16 circuit modules to insert into the Teleporter to get it going again. Of course, time and radiation are against you in your search for the circuits, but there are caches of coins here and there which you can take. When you do though, you have to decide whether to spend the cash on Life Pills to keep you going, or Bombs which help you destroy parts of the maze so that you can get to bits of it that are inaccessible to you. Pressing 'X' explodes a bomb, 'B' buys the pills and the Fire button picks up things.

Molecule Man is part of the Mastertronic budget range at £1.99 and is only available on tape. The style of the graphics is a bit disappointing, the display is absolutely colourless and this makes it look very dark. It reminds me very much of early Spectrum games, all the shapes on the maze are drawn like outlines, very pretty and artistic, outlines maybe, but still outlines when you get right down to it. Not really my sort of game, but at such a low price it is bound to sell well.



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Laser Hawk

Reviewed by **Bred Mountjoy**

Laser Hawk is a new helicopter shoot-em-up from Red Rat Software, the most prolific publisher of games software for Atari II for computer owners in the U.K. at present. Most of their output is of extremely good quality and Laser Hawk is no exception.

Red Rat get no points for originality; however, Laser Hawk does not break new ground in game concept in any way. Veterans Atari owners will recognise the similarity to Super Cobra and AirStrike. Where Laser Hawk scores is in the graphics and playability departments. My congratulations go to Andrew Woodfield for the programming and to Harvey Kong Tin for the super graphics.

For people unfamiliar with these older programs, a description of Laser Hawk follows. Aim the title screens, you find yourself in the role of mercenary Jim Din Aze. You dash from the Aztec building as the waiting helicopter on the take off pad. Into the air you go and straight into the first scrolling landscape. From here the object is to get to end of



the level, destroying buildings, avoiding falling meteors, laser beams, air cannons, volcanic eruptions, flying enemies and many more. At the end of the zone you must destroy the Command Centre to move on to a new

level. There are five Command Centres named Basil, Comm, Aggs, Arts and Sin. Sound familiar? Each zone has floating fuel stations, you just pilot your craft over them to replenish your tanks. Your craft is a Laser Hawk Class 1, but after destruction of the first Centre, your reward is to receive a new craft, the Hawk Star Cruiser, however these steady Centres have rebuilt themselves, I guess you'll just have to start all over again.

Pressing Option selects 1 or 2 players; the second player using another joystick in Port 2. Select screens between 1 to 4 levels and the Space Bar gives a pause game feature. Press 'W' for a beginners practice version in which you cannot be killed.

Laser Hawk costs £9.95 for disk or £7.95 for tape. It is very addictive, extremely playable and very good value for money. If you are new to this type of game, I strongly recommend you give it a try. If you are an old hand that has enjoyed this type of game before, I think you will still find Laser Hawk worth a look, if only for the excellent graphics.

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The Colleen Music Compendium

Reviewed by **Giancarlo**

When you look at the software market, the number of music programs is very sparse. There are a few that stand out from the crowd, such as The Advanced Music Systems from the States. It is quite surprising to find a new company from Wales trying to make an entry into this sparse market.

The product reviewed is a compendium of music programs, retailing for £49.95. Although the compendium occupies two sides of a disk, each program is available separately on a disk or a cassette. The programs are:

The Colleen Music Creator

Package (£19.95 & £14.95)

The Colleen Play-along and Tutor

Package (£12.95 & £10.95)

The Colleen Guitar Tutor and Drum Machine

Package (£12.95 & £10.95)

The Colleen Music and Programming Tutor

Tutor (£12.95 & £10.95)

The compendium is menu driven, with the keyboard and the joystick used for controlling the programs. Unfortunately, there does not appear to be a demo within the various programs to allow you to go back to the main menu, thus it is very annoying to have to re-boot the system to access other choices from the menu. I did not find any problems in running all the programs using an old 803, or an AE 8628C is required, so dig out the cartridge for the 800 and AE users, day-book.

Music Creator

The essential features of this program are:

600 notes per voice

The ability to use all or selected notes

Over 8 octaves Percussion sound effects

freely mixed with each voice

Comprehensive Editing

Phrasing effects with DE-TUNE

Note entry with a joystick.

Icon driven

Music created is machine code, running during VBI and can be incorporated into your own program.

The keyboard occupies the upper half of the screen and the editing area is the bottom half. Notes are selected by the button of the joystick. For example the PER is the composer. After pressing the fire button a screen prompt appears

requesting the choice of notes. To select a note on the keyboard, move the joystick left or right and the active note is stepped through the range. When the chosen note is reached the button enters it into memory. The note value is selectable from a list of standard values.

There are two keyboards available, one for BASS and a STANDARD. During the creation of sounds, the phrasing effect can be introduced at any time by pressing 'P'. Obviously it will be more effective if two or more voices are playing the same note with one or more of them de-tuned. This is a good way to get some very pleasing sounds - especially voices.

To listen to your wonderful efforts, select the PAUSE icon and it is also possible to change the Release and Decay (the D & R of an ADSR waveform) according to a sliding bar. All voices can be paged individually. There are many other features in this program that I liked, especially the ability to save it in one of two ways. These are .MUS and .COL files. The .MUS files are used within the main program, your own creations to reprogram your buddies, or dear old Gran when she pays a visit, but the .COL files are the saving on the cake. These can be compiled into your own programs. The Music Creator is a very useful program utility as well as a source of entertainment. My verdict is that this program is very good value for money if you are considering purchasing it as an individual program. The documentation I had was pre-final, but it was very easy to follow my way through the program and I have no doubt that the final version will be as good, if not better.

Tutors

The flip side of the disk had another menu driven selection of musical programs. The Music Tutor is a very basic description of some of the fundamental music terms and expressions. The Guitar Tutor covers the chord shapes of many popular chords, including major, minor, diminished, etc. From this program a simple guitar tuner can be selected. The E, A, D, G, B, E notes are played, one at a time. The duration is controllable, there are no time pressures to hinder accurate adjustment of the guitar strings. I compared the accuracy of the generated tones to those from my pitch pipe and found they were acceptable.

I think that this little program individually will be of some use to anyone wishing to learn the guitar. I

would have liked to see tunings and chord shapes for Open String Tuning techniques. There is quite a revival going on at the moment with Blues, Blue Grass and good old finger picking to warrant their inclusion. How about it, Colleen??

Play Along is a limited featured program whereby you control the style of playing. The choices are limited to Boogie, Waltz, Disco and Country.

The Drum Machine may be useful to rhythm players. It is possible to set up 250 drum patterns and 250 phrases each holding 8 patterns. The drum sounds were not bad, but I have heard much better examples from other sources.



The Sound Effects program will be of considerable use to the serious programmer who wants to add acoustic colouration to his latest Sci-Fi creation. Many of the sounds that are already available from the menu are very familiar but there are a few new ones, too. The compendium's modest price makes it good value for money and you also have the choice of purchasing the program that you need, if your requirements are specific.

The programs are interesting and varied, as a music entertainment pack but when you consider the Utility value it is very good.

RICK HANSON

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Rick Hanson

Reviewed by Claude Daval

Rick Hanson is a disk based, text only adventure from Robico Software. Robico is a special agent who's assignment is to assassinate an evil general and save the world from the final holocaust! Quite a task, I'm sure you'll agree. This is the first part of a trilogy of games which are being converted onto the Atari from the BBC. The other parts are called Project Thomas and Mjolnir. Rick Hanson was voted 'Best Electronic adventures' and joint 'Best cassette-based BBC adventure' in the A & B Computing Adventure Awards for 1986. The Atari version is said to be even better, having 280 locations, about 70K of text, more objects and problems, a larger vocabulary and a more advanced parser. There is so much detailed text in fact that it is sometimes impossible to fit it all on one screen, so the prompt 'More' is given so you can read further on. The sophisticated parser allows you to type in upper or lower case, inverse letters, full sentences and multiple

statements. The program analyses your commands and acts on certain key words. The interpreter allows 'described objects' to be used, e.g. you may have more than one book, say a red book, a green book and a yellow book. Sentences such as 'Get all the books except the red book then examine the green book and read it' would be understood. If you do not specify which book you mean however, the parser will assume that you are referring to the first one displayed. In our example, Get book would pick up the red book, Typing Get book again would be understood to pick up the green book, and so on. The part of the sentence which is being used will be displayed alongside a white circle. If any command tells you can then see what you went wrong and you can rephrase your sentence and try again. Multiple statements can be entered by separating them with 'and' or 'then' or with full stops or commas.

Other features include a save game option and up to 16 separate game positions can be saved on one disk. There is a Help section which gives you a list of useful words and phrases. Also supplied with the game are an adventures notebook for mapping and recording your progress, a hint booklet and an instruction booklet. Rick Hanson is priced at £14.95 and is available only on disk. Further releases from Robico are planned and these include *Tillul of Xanth* in which you must escape from the *King of Xanth's* dungeon and leave his forbidding island. *Blazing Star* in which you play *Marshall Duck Saddle* and you must hunt down *Will Zelle* and the mean *Meloney Boys* in the old west of the early 1800's and *Enkhar Seven* in which you must reach the surface of *Enkhar Seven* from the seclusion hulls of the interplanetary *Space Hopper* before its orbit decays and you are spellbound into oblivion. They all sound excellent, look out for them!

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SPELLBREAKER

48K disk from Infocom — \$24.95

Reviewed by Gary Crago

Inside the Council Chamber of the Guild Hall at Borphera, the Guildmasters gathered to discuss the sudden falling of magic. The various sorcerers were taking turns concluding about spells that I were once taken for granted and have stopped working properly. Just as Acha of the Guild of Poets was sketching out an insulting mythological allusion in subtle haumanberis, he turned into an orange-colored newt right in front of my very own eyes! As I looked around in shock, I discovered that all the other sorcerers have also been turned into frogs, salamanders or other amphibians, and I am the only survivor! No! There *is* one other. As I looked across to the rear of the room, I saw a shadowy figure in a dark cloak slip silently out of the door. Fighting to control my heart rate, I moved after it. As I attempted to confront it in Robert Square, the figure suddenly disappeared in a puff of orange smoke! Having cleared the air, I discovered a strange white cube and to my surprise a new spell has just appeared in my spellbook. Having picked up the cube, I soon embarked upon a fantastic journey through the very structure of the magical universe, on my quest to locate and confront the source of its unraveling.

My journey began in some ancient ruins where I met an enormous snake, the legendary serpent which long guarded the world, no fear! Stepping through a portal I dropped right into the air, and just when I was about to utter the magical word "RESTORE!", a huge Roc (Well, all Rocs are huge!) grabbed me like a playdoh! Fortunately, escaping from this clutches (I'm actually I pined single enough for a learned enchanter. A timely ascent to the top of a mountain brought me to the checking of a somewhat unhelpful hermit. It was not an IDEAL situation but there again, nothing is permanent in this universe.

Sounds of menacing brought my attention to a troll snuffing from busy-liver. I have never been a lawn gardener, but a little exercise with my magical green thumb and the troll and its treasures are soon departed. After a little splashing around in the sea, I returned to visit that cute little spider. Realizing the problem somewhat brought me to a strange temple and here to face with an enormous tidal of a ferre beast, its single eye glows with a light of its own. With much reluctance, I throw things up a bit,

but Old Rottens here was not eager to hand over its prize!

A visit to a gleamed landscape gave me just the thing for some DIY plumbing. Later, a little cold and wet, I stepped into a dark and foreboding dungeon where I discovered a hint of the form of my adversary! Coming out into the open again, I discovered the delight of using that little purchase I made at the apothecary. As I flew over a huge bird nest, I found that the birdie was away from home, what luck! I soon swooped down to pick up another key to further my discoveries.

Some more busy business proved fruitful. And after visiting my tiny town, I discovered even more weird and wonderful places. Here I am in a perfectly carved octagonal room, wondering: Who built this place? What purpose does it serve? What do those runes mean? And more importantly, what must I do here? When I eventually solved this little problem, I came across a dark cave where all light is being sucked up slowly by some evil darkness. Descending further brought me face to face with the most awesome creature of the dark, my dreaded nightmare has come true! *Awright!*

This is a short account of my journey into Spellbreaker, the final chapter of the Enchanter Trilogy. As before, there are no treasures to collect but a quest to fulfil. In Spellbreaker, magic is suddenly fading in a world that has been founded by sorcery. And only you with only a few spells and your wits, can unravel and destroy the cause of this perplexing chaos. Spellbreaker is rated at expert level and deserves if it is written by Dave Lebling, who has also written *Swordcoast* and *Suspect* all on his own. If you have played *Swordcoast*, you would have already experienced the type of cunning yet logical puzzles presented by this adventure.

Spellbreaker takes up 49K and recognizes over 900 words. Although this makes a larger adventure and a better parser, it also means that the disk is accessed every time a command is entered. Casting a spell causes a lot of disk access which can last nearly 10 seconds and then sometimes it fails to work. Although it is part of the game that spells don't always work, it is surely unnecessary to go through all that disk access if the spell wasn't going to work anyway.

The storyline isn't as well knitted together as *Enchanter* but the atmosphere is as good and the cleverness of the puzzles more than make up for it. The packaging is in the new "BOOK" format and is up to Infocom's usual high standard. The documentation includes a catalogue of tools for enchanter, which makes quite an interesting read. All in all, Spellbreaker is another great adventure from Infocom and a must if you already played *Swordcoast* and *Enchanter*. Now that the prices of Infocom adventures have come down, this trilogy must surely be one of the best value for money computer entertainments around. I cannot recommend it more.

A note to 800 owners: Although the packaging is labeled "ATARI XL", it will work on your old faithful.



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CRACKING THE CODE

by Keith Mayhew Part Ten

Last time the basic operation of player/missiles was covered. This time we conclude their study and start looking at how ANTIC's display lists are built up and used to create custom display screens.

Players Again

The program from last issue demonstrated how image data is stored in a player table and displayed on the screen. Figure 1 shows the format of the player table expected by ANTIC. The first part of the table is not used for the creation of players or missiles and so this space can be used to store other data. The four missiles shown the right part of the table, each taking two bits each with the four players occupying the rest of the table. The data from each segment of the table is displayed from top to bottom of the display as the memory locations increase (that is down the table as it is drawn). The figures to the left of the table refer to the offsets to the segments of the table for single line resolution mode.

In this mode the table occupies a total of 2K bytes with each segment containing 256 bytes to cover the screen display from top to bottom with each byte of data being displayed on one scan line.

The mode used in the program last time was double line resolution. This mode halves the size of the table to 1K bytes with 128 bytes for each segment the offset for this mode are shown to the right of Figure 1. In this mode each byte from the table is repeated over two lines of the display (i.e. it is drawn twice in succession).

Although memory is saved by creating a less detailed image in the double line mode the vertical movement of the image will jump by two lines as it moves a byte at a time up or down the table. To produce a smoother movement in this mode the vertical delay register, VDELAY, can be used. This register uses each bit to control a player or missile. Bits 0 to 3 correspond to missiles 0 to 3 and bits 4 to 7 correspond to players 0 to 3. By writing a bit the appropriate player or missile will be displayed after a delay of one scan line (i.e. it will be moved down by one scan line). Thus to create smooth movement of a player or missile in

double line resolution requires writing a bit in VDELAY for one movement down and then resetting and moving the image down one byte in the table for the next movement of one scan line. Obviously the reverse of this rule applies when you wish to move the image up the screen.

The positioning of a player or missile horizontally is always by colour clocks. A colour clock is the smallest width which can be displayed in a single colour and is equal to the width of two pixels in the highest graphics resolution, e.g. graphics mode 8 from BASIC. We saw last time that the position of each player or missile was controlled by a separate register (HPOBPP 3 and HPOBMD 3), each increment or decrement in value thus causes the image to move by a colour clock, note that there is no corresponding horizontal delay register for linear movement. Whereas the positioning cannot be adjusted, the width of a player or missile can be adjusted by use of an appropriate size register. The registers SIZEP 3 use bits 0 and 1 to determine the size of each player, the other six bits are ignored. A value of 0 or 2 will produce the normal

size for a player where each bit is one colour clock wide, i.e. 16 pixels in the highest resolution mode, a value of 1 doubles the width and a value of 4 doubles it again to four times the original width. The register SIZEM controls the width for each missile in exactly the same way with bits 0 and 1 referring to missile 0 and so on. Note though that horizontal positioning is still at each colour clock no matter what width has been selected.

What hasn't been mentioned so far is that the player table itself cannot reside anywhere in memory but must lie aligned to certain boundaries. We shall see later that similar restrictions are placed on the positioning of information in memory, such as the display list, this was done for a single reason: it simplified the design of ANTIC. Last time it was mentioned that PMBASE was the register which informed ANTIC of the location of the player/missile table. Internally ANTIC uses a 16-bit register to address the player/missile table, as the table is 2K in size in single line resolution mode ANTIC uses the bottom 11 bits of this register as an index into the table which leaves the top five bits to locate the table, i.e. the table must be on a 2K byte boundary. Similarly in double line resolution mode as the table is 1K the top six bits are used to locate it, i.e. the table must be placed on a 1K byte boundary. The top five or six bytes of the PMBASE register are thus used to load the internal register: depending on the mode. Note that the other bits in PMBASE will have no effect on the positioning of the player table so you must remember to position your table to the appropriate 1K or 2K byte boundary. Of course you can have more than one table in memory and switch between them at will.

The colours of the four player/missiles are determined by the contents of the four registers COLPM0-3. As the names of the registers suggest the colour value controls both a player and its associated missile. The actual

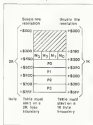


Figure 1. Player/Missile Table

colour selected is determined by the top four bits of a colour register, the next three bits determine the intensity of the colour displayed. Note that its least significant bit has no effect on either the colour or the intensity of a player or missile.

The more interesting aspects of player/missile graphics are their priorities and 'collisions' detection. The register PRIOR shown in Figure 2 controls how player/missiles are displayed.

The two top/bits of this register determine which of the four modes GTIA works in: these will be described another time but for now it is sufficient to say that both bits set to zero is the 'normal' mode with the other three used in the display of graphics modes 9, 10 & 11 from BASIC. The rest of the bits are for player/missile control.

Bit 5, if set to 1, enables a third colour to be generated in the display of two players. The third colour is generated when the data for player 0 & 1 overlap, in this case the colour for the overlap region is determined by taking the colour register values for those players and ORing them together. The same process can independently occur for players 2 & 3 if they overlap, thus by careful selection of colour values it is possible to get 6 colours from the four players. Bit 4, if set to 1, sets the colour of the four missiles to that of COLPRG 3. The idea here is that if the four missiles are positioned side by side they form a 'fifth player' which has a colour independent of the other four players. The last four bits are used to determine the priority of players over each other and the background colours, thus enabling the effect of passing objects over one another. The exact operation of these priorities will probably be described next time.

There are sixteen registers in GTIA for detecting 'collisions' of players and missiles with the background or 'playfield'. A collision simply implies that the display of a player or missile is overlapping with the display of a playfield colour. The registers PO-3FF show the collision of players 0 to 3 with playfield colours respectively, similarly MI-3FF show the collision of missiles 0 to 3 with the playfield colours. Bits 0 to 3 in each register, if set to 1, indicates a

collision with playfield colour 0 to 3 respectively. As an example, if bit 2 was set in P3FF it would indicate a collision (overlap) between player 3 and playfield colour 2.

Registers MO-3FF indicate collisions between missiles and players and PO-3FF indicates collisions between players and players. Bits 0 to 3 now refer to players 0 to 3 respectively but note that in the player-to-player registers that a player does not collide with itself! That is bit 0 of P0FF will always be zero as will bit 1 of P1FF, etc.

If anything is written to the register HITCLR then all the bits in the collision registers will be set to zero, this is necessary because collisions are not cleared automatically. This means that the safest way of using the collision

registers is to always write to HITCLR just before you need them otherwise collisions will get ORed together. Of course you could always compute for yourself if objects overlap but the hardware is much quicker.

The Rest of the Display

The display is built up, as mentioned before, of the combination of ANTIC's display and GTIA's colour and player/missiles. Figure 3 shows the four sections of memory which are accessed by ANTIC's DMA to create the display information which is passed onto GTIA. The 'switches' shown correspond to bits in an ANTIC or GTIA register which controls whether data is fetched or not. It can be seen that for player/missiles to be displayed two switches must be closed.

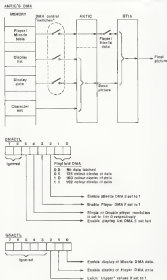


Figure 3. ANTIC's DMA.



Figure 2. PRIOR Register.

the first switch allows ANTIC to actually fetch the data from memory and the second allows the data to be placed in GTIA's registers. Bits 2 & 3 of DMACTL control the fetch of music and player DMA respectively and bits 0 & 1 of GRACCTL control the display of the music and player DMA data respectively. Bit 4 of DMACTL selects whether data is fetched for single or double line resolution when player or music DMA is enabled.

Bit 2 of GRACCTL controls the 'latching' of the trigger values for the joystick. This has nothing to do with the display but as the bit was put in this register it will now be explained. Normally bit 2 of GRACCTL will be zero, this means that the four trigger values from the joystick will be directly readable from TRIG0-3 with bit 0 of each indicating the button is pressed if its value is zero and that the button is up if its value is one. However, when bit 2 of GRACCTL is set to 1 and a button is pressed the value in the appropriate trigger register will go to zero and stay there even if the button is then released, i.e. it has been latched. The value can be reset again to one by writing 0 to bit 2 of GRACCTL and then writing it back to 1 if you still want values latched. I should point out at this stage that on machines with only two joysticks the other two trigger lines (TRIG2 and TRIG3) are used for other purposes.

Coming back to the display, ANTIC reads a 'program' known as the display list to tell it how to build up the display (playfield). Bit 5 of DMACTL must be set to 1 for this operation to occur. Bits 0 & 1 of DMACTL determine how ANTIC is instructed by the display list, i.e. whether actual display data is

sent or not, or if a display is generated, and the other settings create a display of three different widths. The usual setting of bits 0 & 1 is 1 and 0 respectively producing a screen of 160 colour clocks.

Before we move on to look at the display list it is worth remembering that all DMA operations by ANTIC stop the 6532 from processing periodically. Thus if player DMA is enabled but the player is not wanted then the processor is being slowed down unnecessarily, so it is usually best to turn off any DMA you are not using. It is true that you will want to turn the display list or display data DMA off because it will result in a blank screen. However, when display DMA is on, the processor will run faster when ANTIC has to fetch less data, so lower resolution screens will mean faster program execution, much faster if there is no screen at all - but I don't think it will catch on for fast games!

Listing 1 is a simple program which sets up a new display list for ANTIC to use. If Listing 2 is typed in and run it loads in the code, the program is run by typing:

X=USR(1533)

This produces a screen showing one of each of ANTIC's mode lines from one blank line and all the mode lines again in reverse. The program then runs in a loop writing random data over the screen until a control key is pressed. Note that when it stops running you can still type commands to BASIC - you just will not see them because you are looking at a new display.

Looking at Listing 1, the first thing the program does is to save the address of DLST into DLNSTL and SCLSTH. These are the operating system shadow

of the hardware registers DLNSTL and SCLSTH. Once the hardware registers have been updated with this new address, i.e. after the next vertical blank, then ANTIC will start using the display list defined from line 290 to 490. Table 1 shows all the instructions which can be used to build a display list. The first type of instruction is the 'display data', this tells ANTIC to display a line of data in one of the 14 modes available. Modes 2 to 7 are character mapped while modes 8 to 15 are bit mapped. The table shows the number of characters or pixels a line occupies assuming a standard width screen of 160 colour clocks, i.e. DMACTL bits 1 & 0 set to 1 and 0 respectively. It also shows how many colours can be selected from that mode and how many scan lines high the line will be.

With each mode line any combination of the four low bits can be set to achieve scrolling, interrupts or to load the memory scan-counter. The latter flag is essential to tell ANTIC where to find its display data which will fill each subsequent mode line. Line 290 of Listing 1 defines a display instruction for mode 2 with its Load Memory Scan-counter (LMS) flag set. This causes ANTIC to load its scan-counter with the following two bytes. These are defined on line 400 with the WORD directive which takes the address DISPLAY and stores it in low/high byte order. These last three bytes of the display list will cause ANTIC to display a mode 2 line using data from the address DISPLAY. The next two lines define display instructions for the modes from 3 to 15 with no flags set. This will make ANTIC display these lines using data following on from where the first line finished, this

0100 hardware register space...	0200	LDR	RAM000	player number.
0110 DMAS0 =	0205	JCOND		
0120 RAM000 =	0206	LDR	RAM000	player number.
0130 operating system shadow...	0207	STA		
0140 DLNSTL =	0208	JDisplay list pointer low.		
0150 SCLSTH =	0209	JDisplay list pointer high.		
0160 display list instructions...	020A	OR		
0170 JMP =	020B	JMP		
0180 JMB =	020C	JMB		
0190 BL =	020D	JBlank 1 line instruction.		
0200 LMS =	020E	JLoad memory scan flag.		
0210 Program space...	020F	JDisplay list data...		
0220 DISPLAY =	0210	JLMS	Mode 2 & load counter.	
0230	0211	JMODE	DISPLAY address of display.	
0240 PLA	0212	JYTE	2,4,3,4,7,8,9 Modes 3 to 9.	
0250 LDR	0213	JYTE	10,11,12,13,14,15 Modes A to F.	
0260 STA	0214	JYTE	01 Blank 1 line.	
0270 LDR	0215	JLMS	Mode F & load counter.	
0280 STA	0216	JMODE	DISPLAY address of display.	
0290 LDR	0217	JYTE	10,11,12,13,14,15 Modes 3 to 9.	
0300 STA	0218	JYTE	1,2,3,4,5,6,7,8 Modes 7 to 3.	
0310 LDR	0219	JMP+VBL	Jump on next vertical blank.	
0320 LDR	021A	JLMS	DISPLAY address of start.	

```

02 00 000 00000000
03 00 LINE=10000/TEMP (000)=0 START=(32)
04 00 READ HEX,C0000/SUM=0
05 00 FOR I=1 TO 25 STEP 2
06 00 R1=ASC(HEX(I))-(1)=40+ASC(HEX(I))
    I=(I)+40
07 00 SUM=SUM+R1*(I)=10+02-7=(02)16
    (1)
08 70 SUM=SUM+SUM/TEMP START=3,00000+10
    NEXT I
09 00 IF SUM<00000 THEN LINE=LINE+10/NEXT
    0 20
10 70 1 "Checksum error on this line!"
11 70 LIST LINE:END
12 00 PRINT "Data is ready."
13 0000 DATA 00000000000000,475
14 0000 DATA 00000000000000,740
15 0000 DATA 00000000000000,100
16 0000 DATA 00000000000000,925
17 0000 DATA 00000000000000,475
18 0000 DATA 00000000000000,75
19 0000 DATA 00000000000000,175
20 0000 DATA 00000000000000,40
21 0000 DATA 000000000000,124

```

Listing 2

is because the scan counter is incremented after each byte of display data is fetched and unless it is re-loaded with another LMS flag the display data will remain contiguous. Line 400 defines another display instruction which simply produces a single blank scan line on the screen. This second type of instruction can in fact produce anything from 1 to 8 blank lines depending on a three bit count value as shown in Table 1. Although this type of instruction will not cause any data to be fetched, i.e. the scan-counter will not be changed, the interrupt flag can still be set — in fact any ANTIC instruction can cause a so-called display list interrupt if it has bit 7 set as will be described next time.

Lines 440 to 470 define all the mode lines again but in reverse order. Note that the LMS flag has been set on line 440 so the scan-counter will be re-loaded with the address of DISPLAY. This means that these mode lines will look at exactly the same data as the first 14 except it will be displayed in a different mode. It is common only to have one LMS in a display list but there is nothing to stop you re-loading the scan-counter on every line and thus make the screen data non-contiguous.

After ANTIC has produced a single frame, using the data it will then execute the instruction on line 480. This is the third type of instruction shown in Table 1 and causes ANTIC to re-load its display list pointer. In this example the address of the start of the display list follows the instruction so ANTIC goes

TYPE 1 — Display data



if bit 6
and bit 1

Mode No (Hex)	No. of Characters #	No. of Colours	No. of Scan Lines
0	40	2 ¹⁶	8
1	16	2 ¹⁶	8
2	16	2 ¹⁶	8
3	16	2 ¹⁶	8
4	16	2 ¹⁶	8
5	16	2 ¹⁶	8
6	16	2 ¹⁶	8
7	16	2 ¹⁶	8
Mode #1 Mode #			
0	40	2 ¹⁶	8
1	16	2 ¹⁶	8
2	16	2 ¹⁶	8
3	16	2 ¹⁶	8
4	16	2 ¹⁶	8
5	16	2 ¹⁶	8
6	16	2 ¹⁶	8
7	16	2 ¹⁶	8
8	160	2 ¹⁶	1
9	255	2 ¹⁶	1

= Accurate standard with screen of 800x600 pixels
+ = Accuracy may reduce with low resolutions.

TYPE 2 — Blank lines



→ Create display list interrupt if 1

TYPE 3 — Jump



→ Wait for vertical blank RT

→ Create display list interrupt if 1

Table 1. ANTIC Display List Instructions.

back to start displaying it all over again. Before ANTIC starts re-displaying the information it waits for the next vertical blank to occur because the 'VWB' flag had been set. This has the effect of synchronising each frame so as to produce a stable display.

As has already been explained the

program goes around in a loop saving random data at a random position in the 512 bytes starting at DISPLAY thus causing the displayed data to keep changing until a control key is pressed.

Next time we will look at display lists in more detail and discuss scrolling and interrupts among other things.



A = address of DMS - 1
L = length of DMS + 1
KS = where the 5 letter word is kept before comparing it with the tables

OW = the routine Get Word

X = a counter to index into DMS

C = same as X

V, AJ, NK, P, WJ, TMY =
the numbers corresponding to the positions within their respective tables of the verb, adjective, noun, preposition, ordered adjective, and indirect noun.

Well, that's about it. It is now relatively simple to use this in the same manner as the parser described in issue 12. Type it in and play around with commands such as

```
GO
GO NORTH
GO NORTH TO THE BLUE CHAIR
```

If you're lazy, try to get a few verbs working (see issue 12) but in case this article has left you far behind, we'll be back down to earth next time with a short article on screen displays and possibly a complete working adventure to type in, play and study. In the meantime I'd be grateful for any comments or suggestions on this adventure-writing business.

```
IF 18 GOTO 4000
OR 456 ROR #####
TO 487 ROR Get a word routine and then
OR 499 ROR out any useless ones.
OR 499 ROR #####
GZ 200 1=4000,HL2,A+C,L,C,120
GZ 210 1=4000,HL2,A+C,L,C,0,321
WJ 320 IF C=HL1 THEN POP WJ+1
LC 330 IF (L,C)=* *GZ=0R1=C,C,L,C+1
)
WJ 340 C=C+1
OR 350 IF GZ=HL1,400,001,1,400,001 THEN
300
OR 360 RETURN
OR 360 ROR #####
GZ 370 ROR Get user input, then analyse
OR 390 ROR the words.
OR 390 ROR #####
OR 400 C=C+1 *WJ1 *L=0R17 0R1=4001,10
C=L,C,400,000+C,0R1,L,C) *
IF 410 ROR 0R
IF 420 0R=HL1,400,000,W,0R,0R1,C+1
WJ 430 IF THEN ? *L *GJ1 *A verb *L=0R1
C 3000
IF 440 ROR 0R
GZ 450 1=4000,HL1,400,000,W,400,0R1,C+1
A THEN A=L=0R1 0R10
WJ 460 1=4000,HL1,400,000,W,A,400,0R1,C+1
A THEN 0R=4000,0R10
```

```
OR 460 1=4000,HL1,400,0R1,W,400,0R1,C+1
WJ 470 IF THEN ? *What does *GJ1 mean ?
*1=0R10 3000
GZ 480 1=4000,0R10
OR 490 0R10,0R10 0R
OR 1000 1=4000,HL1,400,001,W,400,0R1,C+1
A THEN A=L=4000,0R10
GZ 1100 1=4000,HL1,400,001,0R10,400,0R1,C+1
A THEN 0R=4000,0R10 0R10
GZ 1200 1=4000,HL1,400,001,0R10,400,0R1,C+1
A THEN 0R=4000,0R10 0R10
GZ 1300 ROR #####
OR 1400 ROR Print out word numbers -
OR 1500 ROR usually deal with verbs here
OR 1500 ROR #####
GZ 2000 ? *L *verb+*?
OR 2010 ? *L*?+*?
FL 2020 ? *verb+*?
WJ 2030 ? *verb+*?
GZ 2040 ? *L*?+*?
OR 2050 ? *verb+*?
WJ 2060 IF V THEN 3000-W? V+1,C+1,1,C+5
)
GZ 2070 IF AJ THEN 1=4000-W? A+1,C+1,1,C+5
)
GZ 2080 IF NK THEN 1=4000-W? N+1,C+1,1,C+5
)
GZ 2090 IF P THEN 3=4000-W? P+1,C+1,1,C+5
)
GZ 2100 IF WJ THEN 3=4000-W? W+1,C+1,1,C+5
)
WJ 2110 IF WJ THEN 3=4000-0R1 W+1,C+1,1,C+5
)
WJ 2120 ?
WJ 2130 ROR
WJ 2200 ROR #####
OR 2210 ROR Try something like
WJ 2220 ROR GOTO 4000-0R10
WJ 2230 ROR to get to each verb.
OR 2240 ROR #####
IF 2250 ROR
GZ 2300 1=4000,HL2,A+C,L,C,0,321
GZ 2400 1=4000,HL2,A+C,L,C,0,321
GZ 2500 1=4000,HL2,A+C,L,C,0,321
GZ 2600 1=4000,HL2,A+C,L,C,0,321
GZ 2700 1=4000,HL2,A+C,L,C,0,321
GZ 2800 1=4000,HL2,A+C,L,C,0,321
GZ 2900 1=4000,HL2,A+C,L,C,0,321
GZ 3000 1=4000,HL2,A+C,L,C,0,321
GZ 3100 1=4000,HL2,A+C,L,C,0,321
GZ 3200 1=4000,HL2,A+C,L,C,0,321
GZ 3300 1=4000,HL2,A+C,L,C,0,321
GZ 3400 1=4000,HL2,A+C,L,C,0,321
GZ 3500 1=4000,HL2,A+C,L,C,0,321
GZ 3600 1=4000,HL2,A+C,L,C,0,321
GZ 3700 1=4000,HL2,A+C,L,C,0,321
GZ 3800 1=4000,HL2,A+C,L,C,0,321
GZ 3900 1=4000,HL2,A+C,L,C,0,321
GZ 4000 1=4000,HL2,A+C,L,C,0,321
GZ 4100 1=4000,HL2,A+C,L,C,0,321
GZ 4200 1=4000,HL2,A+C,L,C,0,321
GZ 4300 1=4000,HL2,A+C,L,C,0,321
GZ 4400 1=4000,HL2,A+C,L,C,0,321
GZ 4500 1=4000,HL2,A+C,L,C,0,321
GZ 4600 1=4000,HL2,A+C,L,C,0,321
GZ 4700 1=4000,HL2,A+C,L,C,0,321
GZ 4800 1=4000,HL2,A+C,L,C,0,321
GZ 4900 1=4000,HL2,A+C,L,C,0,321
GZ 5000 1=4000,HL2,A+C,L,C,0,321
GZ 5100 1=4000,HL2,A+C,L,C,0,321
GZ 5200 1=4000,HL2,A+C,L,C,0,321
GZ 5300 1=4000,HL2,A+C,L,C,0,321
GZ 5400 1=4000,HL2,A+C,L,C,0,321
GZ 5500 1=4000,HL2,A+C,L,C,0,321
GZ 5600 1=4000,HL2,A+C,L,C,0,321
GZ 5700 1=4000,HL2,A+C,L,C,0,321
GZ 5800 1=4000,HL2,A+C,L,C,0,321
GZ 5900 1=4000,HL2,A+C,L,C,0,321
GZ 6000 1=4000,HL2,A+C,L,C,0,321
GZ 6100 1=4000,HL2,A+C,L,C,0,321
GZ 6200 1=4000,HL2,A+C,L,C,0,321
GZ 6300 1=4000,HL2,A+C,L,C,0,321
GZ 6400 1=4000,HL2,A+C,L,C,0,321
GZ 6500 1=4000,HL2,A+C,L,C,0,321
GZ 6600 1=4000,HL2,A+C,L,C,0,321
GZ 6700 1=4000,HL2,A+C,L,C,0,321
GZ 6800 1=4000,HL2,A+C,L,C,0,321
GZ 6900 1=4000,HL2,A+C,L,C,0,321
GZ 7000 1=4000,HL2,A+C,L,C,0,321
GZ 7100 1=4000,HL2,A+C,L,C,0,321
GZ 7200 1=4000,HL2,A+C,L,C,0,321
GZ 7300 1=4000,HL2,A+C,L,C,0,321
GZ 7400 1=4000,HL2,A+C,L,C,0,321
GZ 7500 1=4000,HL2,A+C,L,C,0,321
GZ 7600 1=4000,HL2,A+C,L,C,0,321
GZ 7700 1=4000,HL2,A+C,L,C,0,321
GZ 7800 1=4000,HL2,A+C,L,C,0,321
GZ 7900 1=4000,HL2,A+C,L,C,0,321
GZ 8000 1=4000,HL2,A+C,L,C,0,321
GZ 8100 1=4000,HL2,A+C,L,C,0,321
GZ 8200 1=4000,HL2,A+C,L,C,0,321
GZ 8300 1=4000,HL2,A+C,L,C,0,321
GZ 8400 1=4000,HL2,A+C,L,C,0,321
GZ 8500 1=4000,HL2,A+C,L,C,0,321
GZ 8600 1=4000,HL2,A+C,L,C,0,321
GZ 8700 1=4000,HL2,A+C,L,C,0,321
GZ 8800 1=4000,HL2,A+C,L,C,0,321
GZ 8900 1=4000,HL2,A+C,L,C,0,321
GZ 9000 1=4000,HL2,A+C,L,C,0,321
GZ 9100 1=4000,HL2,A+C,L,C,0,321
GZ 9200 1=4000,HL2,A+C,L,C,0,321
GZ 9300 1=4000,HL2,A+C,L,C,0,321
GZ 9400 1=4000,HL2,A+C,L,C,0,321
GZ 9500 1=4000,HL2,A+C,L,C,0,321
GZ 9600 1=4000,HL2,A+C,L,C,0,321
GZ 9700 1=4000,HL2,A+C,L,C,0,321
GZ 9800 1=4000,HL2,A+C,L,C,0,321
GZ 9900 1=4000,HL2,A+C,L,C,0,321
GZ 10000 1=4000,HL2,A+C,L,C,0,321
```

```
OR 4000 1=4000,HL2,A+C,L,C,0,321
GZ 4010 1=4000,HL2,A+C,L,C,0,321
GZ 4020 1=4000,HL2,A+C,L,C,0,321
GZ 4030 1=4000,HL2,A+C,L,C,0,321
GZ 4040 1=4000,HL2,A+C,L,C,0,321
GZ 4050 1=4000,HL2,A+C,L,C,0,321
GZ 4060 1=4000,HL2,A+C,L,C,0,321
GZ 4070 1=4000,HL2,A+C,L,C,0,321
GZ 4080 1=4000,HL2,A+C,L,C,0,321
GZ 4090 1=4000,HL2,A+C,L,C,0,321
GZ 4100 1=4000,HL2,A+C,L,C,0,321
GZ 4110 1=4000,HL2,A+C,L,C,0,321
GZ 4120 1=4000,HL2,A+C,L,C,0,321
GZ 4130 1=4000,HL2,A+C,L,C,0,321
GZ 4140 1=4000,HL2,A+C,L,C,0,321
GZ 4150 1=4000,HL2,A+C,L,C,0,321
GZ 4160 1=4000,HL2,A+C,L,C,0,321
GZ 4170 1=4000,HL2,A+C,L,C,0,321
GZ 4180 1=4000,HL2,A+C,L,C,0,321
GZ 4190 1=4000,HL2,A+C,L,C,0,321
GZ 4200 1=4000,HL2,A+C,L,C,0,321
GZ 4210 1=4000,HL2,A+C,L,C,0,321
GZ 4220 1=4000,HL2,A+C,L,C,0,321
GZ 4230 1=4000,HL2,A+C,L,C,0,321
GZ 4240 1=4000,HL2,A+C,L,C,0,321
GZ 4250 1=4000,HL2,A+C,L,C,0,321
GZ 4260 1=4000,HL2,A+C,L,C,0,321
GZ 4270 1=4000,HL2,A+C,L,C,0,321
GZ 4280 1=4000,HL2,A+C,L,C,0,321
GZ 4290 1=4000,HL2,A+C,L,C,0,321
GZ 4300 1=4000,HL2,A+C,L,C,0,321
GZ 4310 1=4000,HL2,A+C,L,C,0,321
GZ 4320 1=4000,HL2,A+C,L,C,0,321
GZ 4330 1=4000,HL2,A+C,L,C,0,321
GZ 4340 1=4000,HL2,A+C,L,C,0,321
GZ 4350 1=4000,HL2,A+C,L,C,0,321
GZ 4360 1=4000,HL2,A+C,L,C,0,321
GZ 4370 1=4000,HL2,A+C,L,C,0,321
GZ 4380 1=4000,HL2,A+C,L,C,0,321
GZ 4390 1=4000,HL2,A+C,L,C,0,321
GZ 4400 1=4000,HL2,A+C,L,C,0,321
GZ 4410 1=4000,HL2,A+C,L,C,0,321
GZ 4420 1=4000,HL2,A+C,L,C,0,321
GZ 4430 1=4000,HL2,A+C,L,C,0,321
GZ 4440 1=4000,HL2,A+C,L,C,0,321
GZ 4450 1=4000,HL2,A+C,L,C,0,321
GZ 4460 1=4000,HL2,A+C,L,C,0,321
GZ 4470 1=4000,HL2,A+C,L,C,0,321
GZ 4480 1=4000,HL2,A+C,L,C,0,321
GZ 4490 1=4000,HL2,A+C,L,C,0,321
GZ 4500 1=4000,HL2,A+C,L,C,0,321
GZ 4510 1=4000,HL2,A+C,L,C,0,321
GZ 4520 1=4000,HL2,A+C,L,C,0,321
GZ 4530 1=4000,HL2,A+C,L,C,0,321
GZ 4540 1=4000,HL2,A+C,L,C,0,321
GZ 4550 1=4000,HL2,A+C,L,C,0,321
GZ 4560 1=4000,HL2,A+C,L,C,0,321
GZ 4570 1=4000,HL2,A+C,L,C,0,321
GZ 4580 1=4000,HL2,A+C,L,C,0,321
GZ 4590 1=4000,HL2,A+C,L,C,0,321
GZ 4600 1=4000,HL2,A+C,L,C,0,321
GZ 4610 1=4000,HL2,A+C,L,C,0,321
GZ 4620 1=4000,HL2,A+C,L,C,0,321
GZ 4630 1=4000,HL2,A+C,L,C,0,321
GZ 4640 1=4000,HL2,A+C,L,C,0,321
GZ 4650 1=4000,HL2,A+C,L,C,0,321
GZ 4660 1=4000,HL2,A+C,L,C,0,321
GZ 4670 1=4000,HL2,A+C,L,C,0,321
GZ 4680 1=4000,HL2,A+C,L,C,0,321
GZ 4690 1=4000,HL2,A+C,L,C,0,321
GZ 4700 1=4000,HL2,A+C,L,C,0,321
GZ 4710 1=4000,HL2,A+C,L,C,0,321
GZ 4720 1=4000,HL2,A+C,L,C,0,321
GZ 4730 1=4000,HL2,A+C,L,C,0,321
GZ 4740 1=4000,HL2,A+C,L,C,0,321
GZ 4750 1=4000,HL2,A+C,L,C,0,321
GZ 4760 1=4000,HL2,A+C,L,C,0,321
GZ 4770 1=4000,HL2,A+C,L,C,0,321
GZ 4780 1=4000,HL2,A+C,L,C,0,321
GZ 4790 1=4000,HL2,A+C,L,C,0,321
GZ 4800 1=4000,HL2,A+C,L,C,0,321
GZ 4810 1=4000,HL2,A+C,L,C,0,321
GZ 4820 1=4000,HL2,A+C,L,C,0,321
GZ 4830 1=4000,HL2,A+C,L,C,0,321
GZ 4840 1=4000,HL2,A+C,L,C,0,321
GZ 4850 1=4000,HL2,A+C,L,C,0,321
GZ 4860 1=4000,HL2,A+C,L,C,0,321
GZ 4870 1=4000,HL2,A+C,L,C,0,321
GZ 4880 1=4000,HL2,A+C,L,C,0,321
GZ 4890 1=4000,HL2,A+C,L,C,0,321
GZ 4900 1=4000,HL2,A+C,L,C,0,321
GZ 4910 1=4000,HL2,A+C,L,C,0,321
GZ 4920 1=4000,HL2,A+C,L,C,0,321
GZ 4930 1=4000,HL2,A+C,L,C,0,321
GZ 4940 1=4000,HL2,A+C,L,C,0,321
GZ 4950 1=4000,HL2,A+C,L,C,0,321
GZ 4960 1=4000,HL2,A+C,L,C,0,321
GZ 4970 1=4000,HL2,A+C,L,C,0,321
GZ 4980 1=4000,HL2,A+C,L,C,0,321
GZ 4990 1=4000,HL2,A+C,L,C,0,321
GZ 5000 1=4000,HL2,A+C,L,C,0,321
```

Listing 1

NEWSBIT

Updated from the SBC Journal

NEW MICRO-ADDITION SYSTEM FOR AMIGO

Control Basic and Mathmatica are more powerful alternatives to the more primitive, less powerful BASIC calculators produced for the computer. The new product, Micro-Addition System for Amigo, developed by Commodore's personal headquarters, the TRIC-20. The new addition system for Amigo's operation has a built-in calculator, a control unit, a numeric interface unit, and a set of 1000000.

"With this new system, you can increase the accuracy and speed of the Amigo's calculations," says Commodore's president, John D. Young. "With our new system, you can increase the accuracy of the Amigo's calculations, and you can increase the speed of the Amigo's calculations. This new system is a real addition to the Amigo's capabilities."

Also noted about the new product was the fact that the new system is a real addition to the Amigo's capabilities. "The new system is a real addition to the Amigo's capabilities," says Commodore's president, John D. Young. "With our new system, you can increase the accuracy of the Amigo's calculations, and you can increase the speed of the Amigo's calculations. This new system is a real addition to the Amigo's capabilities."

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THE MUSIC STUDIO.

Reviewed by Mike Springer

This piece of software was developed by Mosaic Computers, Hopedale, Perist, Wickman and the manual by Elizabeth Arzooz, collectively known as Audio Light Inc.

This is one of the first musical packages, containing a MIDI application, to reach the market place. It is well packaged and documented, in fact the manual is outstanding, covering every aspect in great detail - which is the reason for including the manual's author in the credits.

The program is not intended as a MIDI oriented program, but has MIDI included as a feature. It is surprisingly versatile, scoring well on both entertainment and education value. To let all the features and its capabilities would be pointless, but some of the major features will be covered.

The Music Studio is a composing utility whereby, with the mouse, you can create a library of sounds, instruments and effects for the ST. A large number of ready made sounds are included, with the facility of adding to them. Music can be composed and notes can be allocated different sounds - up to a museum of 65536, from the sound library.

The composing, adding and storing of music, with the option of adding lyrics and even printing the scores out for a hard copy, are also possible. By adding a MIDI compatible instrument the ST is turned into a very powerful sound generator. By clicking on the right mouse button, you enter the PAINTBOX screen. Here there is a very large set of Trolls and Bars. Beneath this is a palette and various paint brushes for the creation of sound patterns. This aspect is particularly useful for very young children who are learning music and the relationships of sound shapes. Similarly, an adult keen on learning music will find this very useful.

Notes can be entered via the MIDI keyboard or the mouse. The type of note, chordal, quarter, etc, is chosen before entering on the screen, selected from a pull down menu, terminating when changed. Most musical notations are available including sharps, flats, notes, dotted notes and triplets. As the notes are entered, it is identified in a small box at the top of the screen.

Chords, or columns, as they are referred to in the manual, are limited to three when the ST sound generators are used, but if a MIDI instrument capable of playing 6, 8 or 16 notes in the

polyphonic mode is employed, the third can accept them. One has to relocate the mouse pointer over or under the note each time as the chord is built up. This is fiddly, but adequate.

The score range for the ST is at least 8 octaves and with a MIDI instrument the full range of 127 notes, or 11+ octaves is possible. There are five screens within which one works: the COMPOSING screen, INSTRUMENT DESIGN screen, MIDI PARAMETERS screen and the FILE screen. These are entered via pull down menus at the top, the de-fault screen is the main composing screen. The instrument design screen allows you to create, name and file sounds for the ST sound generator. The MIDI parameters screen allows one to select the MIDI voice, channel and octave range within which

are two options: play with or without scrolling. These are selected from the icons at the bottom of the screen, the EAH is for listening only and the HUMPING NOTE scrolls the score as it is being played. Some of the STG files are quite good, considering that they have been designed around simple three note chords. Of course, it is very easy to EDIT these melodies for playing, via MIDI, on a polyphonic synthesizer where up to sixteen notes can be handled. The program's signature tune is quite catchy but the example from Bach's Brandenburg Concerto, Pachelbel's Canon and the Star Spangled Banner are very good. In using the main composing screen the voice, or instrument, is chosen from the small coloured box at the top of the screen. This box opens a menu of 15 sounds - each with its own colour. In the information box next to it, the name of the voice appears.

In the adjacent box, with an icon in the form of a capital, another menu will drop down and a note can be selected. The normal mouse pointer now changes to that of the note and also to the colour of the voice. If the mouse now some the central composing area in the vicinity of the staves, the pitch will change as the pointer goes up and down the screen. By placing the pointer to the voice icon - word or voice can be selected. Some of the voices included are: Bass, Piano, Snare, Cymbal, Clarinet, Flute, Harmonica and Voice. Considering the very poor sound generator of the ST, they are not too bad! After a little experimenting, you will quickly become familiar with the sounds that are available. By loading up some of the included pieces of music you will come across many others, plus you can also create your own.

If possible, acquire some sheet music from a store, or your local library and try to compose your own arrangements. Remember, if you don't have access to a MIDI instrument, you will have to limit the number of notes in a chord to three. Try to develop the habit of entering the notes of one voice, perhaps the drums, then change the voice and go back and enter the accompaniment. Where passages are repeated, whole sections can be blocked off and a click on the button will cause all the notes to be repeated - even very large sections. In the same manner, voices can be changed, mixed or lowered by semitones, increased or decreased in value or even erased.



you wish the sound to cover. The program has been designed around the CASIO series of synthesizers, but I had no problems with my Yamaha DGT. In fact during a recent 'jam session' it handled two DGT's and a Jupiter with some ill will from the ST's sound generators it sounded very nice indeed.

The File screen allows you to load store, append, insert and delete files. A useful and convenient feature also allows a new disk to be initialized too. These selections are made with the mouse, the instruction is entered before the file is selected. When the instruction has been carried out the 'DONE' button is pressed and the file appears on the main composing screen. To play your own, or any of the included pieces, there

FOR YOUR ST

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885 V1.0 (885 V1.0) - The world's loudest 885 - a complete bulletin board system but without the other annoyances at version 2. M8 TERM (M8 TERM) - Advanced communications program lets your ST talk to virtually any other system.

DESK ACCESSORY SOFTWARE

THE ALTERNATIVE (THE ALTERNATIVE) - Macro utility - lets you redefine each of 38 alt keys with a string of up to 60 characters. Perfect time saver designed for keyboarders!

COPPERMAN (COPPERMAN) - Better than a stack for the IBM's desktop accessory gives you a notepad, calculator, address phone book, a dialer (Play) compatible ASCII chart, clock, 15 aquatic games.

EDUCATIONAL SOFTWARE

INTRODUCTION TO ST LOGO (INTRO ST LOGO) - Easy to follow tutorial makes learning Logo simple.

ENTERTAINMENT SOFTWARE

GARDEN (GARDEN) - Blackjack, Clonk, Klondike, Poker Squares, and Solitaire (modern and high society).

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MAJOR ACTION (MAJOR ACTION) - Race down the highway, destroy many cars as you perform various stunts and defenses (look at monitor).

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KIDSEN (KIDSEN) - Delays the inevitable, screen editing.

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Some of the features that I did not like were as follows. The three signatures and bar measure were there for decoration only. If you are familiar with ADVANCED MUSIC SYSTEM II on the old 800 series, you will know that these functions have a meaning and are very important. Not so with the Music Studio. The speed with which a piece can be played is limited to the range of 56 to 200. I would prefer a greater range, say from 10 to 300. Similarly, I would have liked another note and rest value corresponding to a 64th. The volume and speed controls govern the whole performance. It would have been so much more enjoyable to have these control distinct passages allowing for accel./rall and crescendo/decrescendo, in other words sound COLOUR.

Another feature missing from the second colour is the inability to play legato or leggiero, which means smoothly, gracefully. Expression is a vital part of any melody. The ability to change key as well as get another example of a useful feature that is missing. Many composers will introduce key changes throughout the piece to change the mood and character. Some will also have numerous tempo changes thrown in for good measure too. Take for example, 'Memory' from Cats by Andrew Lloyd Webber. Here one finds three tone signature changes in the first ten bars and no fewer than three key changes throughout the piece. To play this piece effectively with the Music Studio is impossible, one can get pretty close, but that's about it. Having that

composing screen 'live' is very annoying. After only a few minutes the volume of the monitor and/or speakers is quickly turned down. It would have been much better if it were live only when a note was being entered. Lastly, it is a great shame that it is only available in colour. Having the option of monochrome and its increased resolution could possibly introduce many additional features and also slash the very large number of owners who only use monochrome. The current retail price is about £35. At this price this has to be one of the best value-for-money pieces of software I have seen for a long while. On a mailing out of 100 I will give it 10 for Educational Value, 9 for Entertainment Value, 6 for Ease of Use and 10 for Value for money.

Starglider

Reviewed by Michael Stanger

There are clones and there are clones, but I cannot remember ever being stopped in my tracks by a game. Many are impressive, remarkable and until now, only found on the old 8-bit Atari. The Prism has established itself as a deserved leader in demonstrating — to those sceptics — the awesome power of the ST. That was until Rastard launched 'The Starglider'.

The game is neatly boxed and comes with a game play — a book which is required reading, a keyguide — a poster of the AGAV (Airborne Ground Attack Vehicle) and the program disk.

The disk into-boots in colour and more, so those ST owners with only mono systems will not be left out in the cold!

After about forty seconds the game starts with an intro screen and a musical accompaniment. Not just any old musical introduction, but about twenty seconds of a pop group sound sample! They are all there, about five vocals, drums, synthesizers and guitars. It is superb.

Sound sampling is not restricted to the musical introduction, a very charming female voice warns you when the AGAV requires servicing and when you have successfully docked with a silo and repairs — laser repairs plasma drives, etc have been explained! She may appear later in the game, but I have not met her again. Mind you, I am still a humble Rookie!

The book mentioned earlier, has to be read to pick up the hints towards a strategic game plan. But in all honesty,

it was a few days before I felt got down to reading the story.

I will keep the scenario very brief. Your planetary system is under attack from a merciless foe. He is armed with some formidable weaponry systems, but the ace up his sleeve is the Starglider.

Your planet is almost annihilated, but you discover the AGAV is a weapon. Back to the protection surrounding your planet that ground weapons, aircraft and an army are considered pointless. That was mistake number one. There are four underground service silos for the AGAV still in full operation. The only reason for this is because the authorities forgot all about their existence due to robots sensing them!

Although the colour version is very impressive, I much prefer the greater resolution of the monochrome. The contrast of animated vector graphics is

used. The detail is quite stunning and the action is fast and furious.

You fly the AGAV with the mouse. I wear a large board on my lap and I can settle down in my lounge in comfortable comfort for a couple of hours relaxation. It took quite a few hours to develop a competent flying skill, when I could manoeuvre the craft into all forms of climbing/descending turns and spins without having to fumble at the mouse buttons to perform them.

The author of the program is twenty years old Londoner, Jeremy (Max) Sims of Argonaut Software and I look forward to his future programs with great anticipation.

The game will retail for less than £25, which is good news. My verdict is 10 for program design, 10 for presentation, 11 for graphics and sound. An ideal Christmas present.



TRIMbase

Reviewed by Michael Stanger

Designed and programmed by Andrew Cohn and Chris Maden, and distributed by Talent Computer Systems, the cost is £89.95, including VAT. It is described as a "Full Relational Database, integrated with GEM and supposedly easy to use." The technical specifications are:

Operating System — GEM
Multi-File Operation — Yes.
Maximum Record Size — One screen.
Maximum field size — No limitation within maximum record.
Maximum number of fields — as above.
Language versions — English and German available.

Although it is not documented in the specification list the maximum number of records possible is 32,000. I had seen an example of the program at the recent PCW Exhibition and it looked impressive, but looks can be deceptive! TRIMbase quickly sent me a copy upon request and I started to familiarise myself with it. All went well until I tried to define my own records. The program just locked up. I returned the disk to TRIMbase and they quickly returned with another. They stated that they had tried the returned disk and programs on other drives, but could not reproduce any of the faults that I had described. The disk they returned to me was in fact another version, 1.4B. The disk I had originally was version 1.4A! This new disk I was informed, was well and truly tested and if it failed to load etc they would investigate further.

In all honesty, I can only appraise a product that I am given. This disk also had a fault, but it did not demonstrate any of those faults that I had experienced earlier. This fault I will come to in due course.

Let me say at the beginning that I liked the concept employed in its design. There are three integrated programs, Maintain, Define and Report.

The record file is created with the Define program, which can be called from either of the other two programs or as a stand alone program from the disk top.

Once you are satisfied with the layout of the record, the record, and data is entered from the Maintain program. To produce report forms containing data obtained from the database, the Report program is used.

Define

Press different types of field any

supported in this program. The first is NUMBERS: integers, currency and decimals. The second is a DATE field, the third is under the heading of CLASS VARIABLES. Class Variables are short, regularly used variables with a few possible values, such as Mr/Ms/Mr/De/Male/Female/Hot/Cold, etc. The remaining types are TEXT and BLOCK.

The field heading is decided, such as "Name:" and when Return is pressed, a small menu appears. The field heading would require the choice of TEXT, selecting this with the mouse and hitting Return, a request for the length of text in characters. In this instance, 20 would probably suffice.

In a similar manner another field called "Address:" may be created. With a field such as an address, there are two options. One is to use TEXT or another choice is BLOCK. Once again the size of the field is decided.

Perhaps another field would be "Telephone Number." The field type in this instance should only include numbers, so the logical choice of field type would be NUMBER and a suitable length of 12. After entering all the field data, you may decide to include another field called "Title." This field could fall under TEXT or CLASS VARIABLE, if the latter is chosen, then the data for the Title field can be defined. For example, Mr, Mrs, Miss and so on. The program would only let you enter data in the manner in which you defined it. MR would not be accepted, neither would Mrs: the first is in block capitals and a missing full stop, the latter also has a missing full stop.

Once you are satisfied with its appearance and size, it can be saved. If, at any time in the future you have a need to edit the file, by adding additional

fields such as "Postcode" or "Birthday" it is very easy to make such changes. There is a special facility for this very purpose in one of the menus of the Define program.

Data for the database can be entered from two sources, the keyboard or imported from compatible files constructed by other programs. I have not tried the latter feature, therefore I will decline from making any comments.

It is very easy to sort the file into any order that you may require, but when you have finished with the file and written it back to the disk, EXTREME CAUTION must be observed. The manual devotes quite a great deal of space to this procedure. The reason for such caution is due to the fact that files are HELD IN RAM! Do you remember the database that I USED to be given away with the ST which I reviewed in an earlier edition of MONITOR? This uses a similar method of file handling and, surprise, surprise, you got the same old problems. Some people will never learn!!

When a complete file is held in RAM it is asking for problems and, unfortunately, little notices such as glitches and badly written routines DO appear at frequent intervals and can cause havoc. I like the little warning prompts that appear when you try loading a file that is corrupted? "My warning prompts are not very amusing downright disgusting in fact. What to do now?" The answer to that question is very simple "Load up the backup file. I hear you cheer. Correct, I was just checking! So you save disks, re-load and what happens?" The file that you backed up is also corrupted, because unknowingly, you had duplicated a corrupt file. A secure filing system is paramount.



If you had spent a great number of hours in creating a file, only to find that it is corrupted, you instinctively dig into the Utilities box and dig out Microdot's Main Utility and attempt to repair the damage, if you can! It is bad enough if it is one of your own files, but if it is one of the files included as part of the Tutorial on the manufacturer's disk, a gosh pitiful! Yes, it did happen to me.

If you have a printer, or access to one, a very creditable feature of this program is the Report Generator. If you need to prepare address labels, mail programs and the like, this section is ideal. It is very simple to use, with adequate help from the menu and their contents. I could only persuade one of the Reports to work. Trying to display the other file, I was greeted with the familiar border and dumped unceremoniously onto the Desk Top.

I could expound to a number of boring pages all the faults and debits of this program, starting from the opening request to input the date.

In the file that you create, where a Date field is used, you enter the date as a numerical string into a box that is justified in this manner: / / logical and convenient. But the designers ask you to enter the day, press the down arrow, enter the month, press the down arrow, enter the year and a final press of the return key. Why couldn't they have used the same method as you? It would then be very simple to use one of the many Boolean algorithms to select the date result.

Or I could expound on the lack of printing facilities, cancelling File loading requests, untested Help screens, badly written GEM requests such as scrolling, gliding, paging, deep-down menus and so on. The concepts behind the program are superb: it is the actual end product that is so lacking. If only greater care had been used in the GEM routines, a better use of GEM Resource capabilities and the use of a disk filing system, this would be an excellent product. I often wonder when I see comments regarding this program such as "Talent has taken the full potential of the vast processing the ST possesses... an excellent product", or "... the relational operations are particularly useful for efficient database management and the report generator is very useful indeed" can it possibly be the same product that has been reviewed? Apart from the potential of the Report Generator, I could find not one impressive feature... that would certainly give me little reason to re-install the

beginning of the manual 'WARNING, TRIMbase has been carefully and thoroughly tested by many people before being offered for sale, and we believe it to be free from major errors. However, untestable computers, untestable power supplies and perfect programs just don't exist. If your database contains vital information, you must protect yourself by keeping backup files so that if anything goes wrong your data can be recovered.

This program went on sale to the general public in the late spring. After receiving two different versions in the space of a week, as the *Autumn*, I wonder if anyone knows testing took place (so called Alpha Testing) or if any one issue (or Beta Testing) took place before it was released for sale and Mr. 'the Public' does all the testing for them?

It is all very well to try and cover bad practice with statements such as 'perfect programs do not exist', but I maintain that they SHOULD be perfect. BEFORE they are sold. The few demands that the article bore on verifiable quality, so there exists an ethical and a legal obligation which must be met by the manufacturer. For almost £50, this program is a close competitor to dMAN - a dBASE III clone which retails for £99. Quite honestly, there is no

comparator!

Record handling by TRIMbase is in RAM, dMAN is disk.

A record is limited to one page with TRIMbase, a record can be up to 4000 characters with dMAN.

Record length is limited to 32000 with TRIMbase and dMAN has no such restrictions.

TRIMbase can only perform very limited mathematical functions, typically the addition of all numerical fields and a crude statistical analysis. dMAN is capable of implementing quite impressive mathematical routines and formulae.

TRIMbase is GEM based, but not to the standard set by many other programs. dMAN is not GEM based, although a GEM version is directly to be released.

TRIMbase uses its own limited functions, whereas dMAN is based upon the industrial standard, dBASE III. This is a probable reason why Atari have taken such an interest in the product. Apparently they are using dMAN extensively throughout the organisation. I am impressed with the specifications of the clone and I look forward to reviewing it for you in the near future. Regular readers of this section will know I am always on the lookout for a good Database. Well, I am self looking!

Easy Record

from Microdot at £39.95
Atari ST Mono Colour
Reviewed by Matthew Tyldeman

Easy Record, a management system for C programming, is one of Microdot's most recent releases for the Atari ST and helps those programming in C to create and maintain data records in one simple operation. Although Easy Record is not a database system, it is a storage system for handling information stored in systems such as databases.

The File Management System and the File Set up Program form the main content of the package. The File Management System is a set of C functions which consist of the necessary code to create and access index and record files, while the File Set up Program is a GEM menu driven utility where you, the programmer, can specify the values and the attributes of index and record files. Output is in the form of C source code and/or small c-like descriptor blocks (the record and its index file) which are split into two parts. One part of the file contains the index(es) and the other

contains the records (together with linked lists for key fields allowing duplicates). Therefore there is only one index file per record file.

Easy Record is ready to run after a few simple setup steps. Definition of your applications record storage requirements is the first thing, file attributes must then be set using the File Setup Program. From here on, you are able to create the file descriptions from your application and create 'active' files. Maintenance of your records is then possible by use of the File Management System. Easy Record allows management of records for up to 16 indexed record files at any one time. Eight key fields (with 125 bytes per key field) per indexed record file with eight subfields per key field.

Easy Record is a product written by professionals, for professionals and should help all C programmers whose data records seem to take forever to organise and keep in an orderly fashion. For £39.95 Easy Record should make senseless drag C source code a nuisance.

Electronic Pool

Reviewed by Michael Strieter

This is almost a direct copy of the video arcade game, and very similar to the pool games currently released for other machines. There is nothing about the display that makes it stand out, perhaps the graphics are sharper and the colours more vivid, but it doesn't stand out from the crowd.

It is the standard 6-ball pool game with a standard pool table. It can be played on a colour or mono system, yet prefer the mono version, due to the greater clarity and crisper graphics. The

game play is very simple. You have to pot the balls! Points are awarded according to the ball value and the multiplier allocated to the pocket at the moment of potting. The multiplier factor ranges from X1 to X6 and rotates around the table for each shot and the ball's value is 100 its number.

You are allowed three attempts to pot a ball. If, after three attempts, you fail to pot, you forfeit a cue ball. A cue ball is also forfeited if you foul a miss or in-off. At the start of the game you have three cue balls. The cue ball is re-positioned in the D' and another frame is racked up after each frame is completed, even if you are still using the initial cue ball.

To make life slightly more bearable, the function keys are 'Fire' Keys. Pressing these, except F1 which rotates the game, may have unpredictable results.

I would have preferred to see a ghost cue ball instead of a cross wire to determine the sinking point. The signature tune was 'ruled' from 'The Hunter'. It has a certain resemblance to that well known ditty by Joplin. In fact it's a bit disbelieved, all you musical buffs will notice the burn-note should have been C's and not E's!

Retailing for less than £20, it is not a bad game, on the other hand, it is not that great, either! That is, once you get past the signature tune. It pays to play the game with the volume at maximum.



Pinball Factory

Reviewed by Michael Strieter

Old 8-bit Atari hackers will remember with great affection the pinball utilities that came out a couple of years ago and the enjoyment they produced. A few months went by and these were quite a number of rather naughty and crude creations during the rounds!

Pinball Factory allows you to create new and wonderful works of art. The program will only run in colour, hence followers please note! The finished product is far better than any created like the older machine, due mainly to the brilliant colours and higher graphic capability of the 16-bit machine. It is also much more comfortable with the mouse

as a controller than trying to manoeuvre a pair of joysticks!

Although it can be played with key-based commands, I found it much easier to hold the mouse cupped in both hands with the thumbs operating the left/right buttons, which control the flippers and the left fingers underneath, controlling the ball, where necessary, to invoke the Tilt mechanism. Yes, it even has that novel feature — but don't let too eggs, you can over-do it!

The program comes with a small, but a dequate, manual. It is very easy to absorb all the features of a table bumpers, flippers, ball catches and so

on. With the built in Graphics Editor it is just as easy to add, or edit, very colourful backgrounds providing an ideal gallery to show off your artistic talents. Games are very easily saved in 32K files.

I liked the program. Mind you, I also liked the 8-bit versions as well, such as 'Master Blaster', 'Knobs and Knockers' and so on! I hope it is not too long before we see some games that YOU have created coming round on the circuit.

'Pinball Factory' was created by an unknown party or parties and retails for less than £25.

DEATHZONE



Suddenly, your scanner detects the presence of an alien. Moments later 2 missiles into view, charging headlong at you. In desperation, you back off, firing salvos of new energy bolts at your attacker. One strikes home and the alien pool disintegrates into scintillating dust. You were lucky that time—but how much longer will you be able to survive in the Deathzone?

Deathzone is a fast moving 3 dimensional arcade game that will work on all 8 bit Atari micros. Although it will run in 16K, you will need at least 32K to type it in. If you own a 16K machine you will need to ask a friend with a larger system to help you type in Listing 1 and RUN it. Once the boot tape or disk has been created, you can then load and play Deathzone on your 16K computer.

Typing it in

Listing 1 is the Atari BASIC program that will create an autoboot version of Deathzone on disk or cassette. Obviously, the data is written in hexadecimal in order to make the program as small as possible.

Please note that this listing will not fit in a 16K system.

The assembly language source code is provided on Monitor disk 14 for those of you who are interested in seeing how the game works. You do not have to load this in to play the game!

Cassette Instructions

Type Listing 1 into your computer using BASIC. Remember that you will need at least 32K. If you are not using KEYO then just ignore the two checksum letters before the line numbers. When you have finished typing it in, save it off (this is just in case you lose all your typing when you RUN the program) and then RUN it.

You will be asked if you require a cassette or disk version. You should type 0 and press [RETURN]. The program will then check the data, and will

by Steve Hillen Disk/Cassette Runs in 16K

notify you of any errors. When all the data is correct, the computer will prompt you to insert a blank cassette into your recorder, press [PLAY] and [RECORD] and then press [RETURN]. The program will now save off an autoboot cassette version of Deathzone.

It's also a good idea to CSAVE the BASIC code before turning off the computer, in case the autoboot copy does not function; then you can reload all your typing and start again!

To play Deathzone, turn off your computer, remove all cartridges and pressing the [START] key, turn on the computer. If you own an XL or XE then press [OPTION] as well. Press [PLAY] on the recorder, and then [RETURN]. Deathzone will load and run automatically.

Disk Instructions

Type Listing 1 into your computer, remembering that you need at least 32K. If you are not using KEYO then just ignore the two checksum characters before each line number. When you've finished, RUN the program. Type 1 and press [RETURN] to tell the program to make a disk version of Deathzone.

The program will check the data statements, notify you of any errors. Once all errors have been corrected, the program will ask you to insert a disk with DOS 2.0 and press [RETURN]. Use either DOS 2.0 or DOS 2.5. The program will now create an AUTORUN SYS file on that disk. Do not change the filename! Save the BASIC program out before continuing in case you need to go back to it.

To play Deathzone, insert the disk containing the AUTORUN SYS file into your drive, remove all cartridges and boot the system. Deathzone will load and run automatically.

Playing Deathzone

If you have followed the instructions correctly, you will now be looking at the title page for Deathzone. Both the left (L) and right (R) screens are shown. You can start the game either by pressing the trigger of joystick 1 or by pressing the [START] key. If you should wish to abort a game before completion either the [SELECT] or [OPTION] keys will bring you back to the title page.

When you start the game, you will notice that the screen is divided into sections. At the very top is a horizontal line whose length indicates how close the alien is. Two sets of directional arrows at either end of the line indicate whether the alien is to your front, left, right or rear.

The next line is the status line showing from left to right your score, lives remaining, and the current level of play. Further down, there is a standard radar scanner superimposed on the sky. The white central dot represents your own position, of course.

By using the joystick, you can move in and out of the screen, or swivel on the spot. You must do your best to avoid both the aliens themselves and the energy bolts that they fire. Each time you are hit, you will lose a life. You will need to dodge, reverse away and fire rapidly in order to destroy the aliens before they reach you. Incidentally, you can pause the game with the space-bar and continue it by moving the joystick.

Every so often, an alien pod with rather different characteristics will attack you. If you should succeed in destroying it, then you will receive an extra life and move up to the next level of play. If not, then you will have to restart that level. There are a total of 6 levels, each progressively more difficult than the last. Should you complete the last level, well... wait and see!

Lastly, a word of thanks to my brother for writing a "black-box" 16-bit mafia package around which the game was based.

[illegible]

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9.8 Johnson's Treatment Algorithm (Madsen, 1996, p. 70)

HAPPY REVISION 7.0

Reviewed by Rick Holthaus
Reprinted from Current Notes.

Not too long ago, I received a strange envelope in the post. On the outside was stamped "Rev 7". Then it hit me. Could it be? It was indeed! The long awaited Happy Rev 7, something I thought would never be released, was finally in my hot little hands.

For most *Attn* users, the word "Happy" is synonymous with the word "backup". In fact, the Happy Backup program tends to overshadow other aspects of the Happy package. For those of you not familiar with a Happy drive, the Happy is a drive enhancement for the R10 and 1050 drives. It's a custom chip board that replaces the *Attn* EPROM and 6507 CPU. The board plugs in where the 6507 was removed. On board is the Happy ROM, a 6502 CPU and, depending on the board, either 6K or 6K of RAM.

Such a board set-up enables very fast reads of a disk, enables true double density (1050-only), a permanent record of which density the disk is in (so the density doesn't have to be read each time the disk is accessed), disk formatting capabilities not available to a standard drive, and other neat things.

Somebody booting up a Happy drive for the first time will be amazed at how quickly it reads. The drive will read the entire track in 1.15 revolutions of the disk. This track is read into the onboard RAM buffer, then transferred as machine-gun like speed to your computer. This type of disk read is termed "back buffering". Theoretically speaking, if the drive had enough RAM onboard, it could read the entire disk in 42 disk revolutions. The drive would never have to be accessed again for a read operation. The Happy would just read from the RAM instead of the disk.

A couple of exceptions to the fast read time. One is with a disk formatted by the Indus GT drive while in Synchronesh mode. Both the Happy and the 1050 Duplicate have a very tough time trying to read this disk. The Indus places a non-standard sector arrangement on the track, and for reasons I don't know, makes life tougher for these enhancements. The other exception is with a commercial disk protected using a double sectoring technique. These enhancements cannot correctly read through the double sector.

A Happy drive will recognize a read or write to sectors 81000 - 9777. This is the RAM buffer on the Happy board.

Happy takes part of it in conjunction with the drive ROM for various purposes. The Onstream manual states that 18000-up is the addressing for the RAM. I guess it just depends on the board you have.



Program Operation

The overall operation of the various programs is excellent. Every error except one I have encountered has been trapped. Since the backup and compactor, among others, load some of these programs into the drive buffer, turning your disk drive off and on during operation of the above will result in an error, since the buffer will be closed on power up. The programming itself is very professional. It is obvious someone invested quite a lot of time on working out all possible bugs.

Warp Speed Menu

Upon booting up, the user will be presented with the Happy Rev 7.0 Warp Speed Menu. Also displayed is the number(s) of Happy drives in the system, either a 1050 or an *Attn* RAMdisk, the amount of memory available to the user, and whether any trace information (explained later) is available. Below is the Warp Speed Menu.

1. DRIVE OPTIONS
2. DIAGNOSTIC
3. SECTOR CORREX
4. HAPPY BACKUP PROGRAM
5. HAPPY COMPACTOR PROGRAM
6. MULTI DRIVE PROGRAM
7. ENABLE TRACER
8. DISPLAY TRACER INFORMATION

I'll go over each of the above in order, with the exception of the backup program. This deserves a detailed description.

1. Drive Options

This option displays a sub-menu, with functions deserving individual comment:

SET UNHAPPY MODE
INIT DRIVE
CHANGE DRIVE NUMBER
SET TO NEW GT DELAY
SET TO U.S. EMU
SET WRITE PROTECT, ENABLE
SET TO FAST WRITE

Set Unhappy Mode:

By placing the Happy drive in the unhappy mode, your drive will resemble a stock drive, with the exception of allowing double density. I thought that a Happy drive placed in this mode was undesirable, however.

Computek informed me there was a program on the market that would not operate properly in the unhappy mode with previous versions of its software.

The program is "Alternate Reality". A custom ROM routine is used to read the disk and, for reasons beyond me, would not operate correctly on "unhappy" Happy drives. Happy Computers stated they don't know if this was a deliberate attempt to jerk out the Happy, or was just coincidental. In any case, this has been taken care of in Rev 7.0.

This is also a good time to point out how programmable this drive really is. The Happy drive only recognizes a few commands on boot up. The standard read, write, etc., and a few special ones the drive uses. These are transferred to the RAM buffer on board. This procedure gives Happy enormous flexibility, as it allows each program from the menu to load only the commands it needs at the time, and allows these commands to be changed easily if needed.

Init Drive:

By selecting this option, the drive assumes the state of just being turned on.

Change Drive Number:

Allows the user the option of changing the Happy drive from, say, drive one to drive three, without having to mess with the switches on the rear of the drive. (Boy, can this come in handy!)

Set to Slow Off Delay:

Changes the time, from a scale of A-Z, the drive takes to timeout after the last disk operation.

Set to U.S. EMU:

I frankly don't understand this option. To drive it has to do with allowing Sparta-DOS to operate on the Happy at high speed. It also says something about improving some of the IO aspects of some Happy's. I just don't know. I'm reading finer the manual here, but it still doesn't mean much to me. I also don't have Sparta-DOS. Sparta-DOS users will probably be able to understand this much better than I.

Set Write Protect, Enable:

These options are available only if the user has the HDIO Controller switch. This will either write protect, without a write protect tab, or write to either side of a disk, matched or not.

Set to Fast Write:

I think I had my Happy 4 months, before I realized the significance of this option. It is not explained in the How to Use instructions to any great degree, but it is in the ? manual. Anyway, this allows for fast writes on a Happy drive. Normal write speed is improved, and it is actually a fast write with verify! Happy users may try this by choosing this option, then booting up a DOS and copying a file. The difference is very noticeable. I liked this so much I made a small DOS file that enables this option and places it on every of my DOS disks. The option stays enabled until the drive is turned off.

A word of caution: The drive may appear to have finished the write operation, but is not actually completed until the red light on the drive goes off. If the door is opened before the light is off the light will begin blinking, which means a write verify error has occurred. So many people remove the disk from the drive before the light goes off, that Happy had to make the default condition of this option "off".

2. Diagnostic

The Happy Diagnostic checks for correct operation of drive RPM, controller switch, high speed IO, reads and writes in all three densities, and a test of the Happy itself. Altogether, a pretty comprehensive package.

3. Sector Copier

If you have never seen a Happy in

operation before, and have the opportunity to see just one feature, this is it. The read and write speed is incredible, and the first time I saw it going, I thought my drive was broken. The program does not use the SIO access location at \$E059, instead, Happy designed a custom program embedded inside the Sector Copier. Normal SIO baud rate is around 19,200. The Sector Copier operates at over 40,000. He says even the time could be improved even more, but I think they mentioned something about compatibility with the BIOS, which allows the two to work together, as the reason for its current limitations. Indian drive owners will notice the resemblance to Synchronix. However, this SIO routine will knock their socks off the Indian in write operations. No special format is needed either, as the Indian requires.

The program operates in all three densities, and you can pick the density you want or let Happy automatically choose it for you. This program also supports RAMdisk operation, so a single density disk can be copied in one sweep. If a bad sector of any type is encountered, operation is ceased, and an error message is printed.

4. Happy Backup Program

See comments further on in this article.

5. Compactor Program

This program alone is darn near worth the price of the package. The Compactor is used to combine and file locating programs that do not use the entire disk onto a single disk, and all protection is displaced. Compacted disks may only be used on a Happy drive.

For example, say I have three programs, each twelve tracks in length. I wish to combine the three onto a single disk. Using the Happy Tracer, I would first trace out a disk, then load the Compactor. The Compactor checks a directory to make sure enough room is available, then copies the tracks previously traced from the original disk to the compacted disk. It then asks for a filename, which may be up to 16 characters in length.

To load and run a compacted disk, insert the disk into the Happy drive. A menu will be presented. Push the appropriate number, and away you go. The Happy then loads in necessary data to the drive buffer and places the drive in the happy mode. You cannot write to the disk, nor will the Happy be recognized, until the program is loaded and you open the drive door. When the door opens, writing is enabled and your Happy goes out of the unhappy mode to normal Happy operation. Backup capabilities of the Compactor are

equivalent to the Happy Backup Res 6.6.

I have used this program extensively to back up programs. But by using this when I am in need of the Backup, I have cut the number of disks I have needed by about 60%.

6. Multi Drive

The Multi Drive is for a two-drive Happy drive system configuration. As I have but one Happy drive, I can only pass on what is said in the manual. This option allows up to three copies of a source disk to be written in slightly longer than it takes to make one copy. The drives actually read and write at the same time. This sounds pretty impressive. It copies some forms of protection, but not drive alignment or FDD files (explained in Happy Backup section). This would increase the time to copy the disks. This is best used to backup or make many copies of a DOS file or part a data disk.

7/8. Enable/Display Tracer

The tracer is a special function used mainly by the Compactor, and to a small degree, by the Backup program. By enabling the tracer, you have locked the enhancement out from the computer. Your drive resembles a stock drive. The computer is now relocated with the disk you would like to trace. Unknown to the computer, the Happy is watching the serial bus, and remembering the number of each individual track accessed by the drive. After all data on the disk has been accessed, reboot the Warp Speed Menu, select option eight, Display Tracer Info, and a map of all tracks accessed for the disk you traced is displayed. This is quite a wacky little operation to watch!

Happy Backup Option

The option allows the user to make archival copies of protected software. After loading the selection, the user is given the options of either copying the entire disk, or going to a "Special Recovery Menu". This menu will allow the user to just copy the tracks he chooses, increase or decrease the number of times a track can be re-read if not read correctly at first (good for trying to read a garbled track), and other parameter setting. There are also two important choices here. The first is the slow alignment selection. This will increase the copy time quite a bit, but this selection is needed on a few programs that are heavily skewed. The other, and the one surely appreciated by all Happy users, is the Forced Slow Mode selection. By choosing this option, the Happy drive will place a special format on the disk. This format automatically places the drive in a slow read mode. As most commercial programs may not be read in the fast

read mode, this means the user gets a bit of time from booting up the Happy software and turning the enhancement off. The program will also recognise a two Happy drive set-up, with the source drive always on, and the destination drive the other Happy.

The copy process then begins. The process is very fast. I think this is the same SMD routine used in the sector copier, or very similar. It is slower though, because a lot of extra disk commands are needed to analyse the track and sectors. Displayed on the screen will be the track the program is on and the number of good sectors in that track. If a track is encountered that contains 20 or more sectors, the process aborts and an error message is displayed on the screen. This is also where the Rev 7 Q takes over.

POB Files

When I first booted up Rev 7 software, visions of disk wizardry and magic were dancing through my head. I was surprised by what I received. Any program with a protection format using 20 sectors or more per track (and virtually every new piece of software) requires the use of a 'Pre-Determined Backup' file, a.k.a. a 'POB' file. There are 24 POB files on the disk. Some pertain to individual programs, others can be used for all disks by a company. An example would be POB file number 3. This file is used to backup Electronic Arts programs. The protection scheme has already been figured out, and all the user does is hit start. All necessary data will be written to the disk.

20 Sector Tracks:

For a track with 20 sectors on it, the backup program will write out these 20 sectors without slowing down the drive. Happy Computers claim they originally came out with the 'autopaced' mode for Rev 5.2. This mode would slow down the drive to about 27% rpm, allowing 20 and 21 sector writes. The only other way I know to write 20 sectors is by eliminating write of the 10-type bytes for each sector. These bytes are useless to the computer, and contain such information as the track number, sector number, CRC, and more. Not all these bytes are needed however. By eliminating some of these bytes, more room is available for writing sectors, enough to lay the 20th sector. These disks may be run on any drive.

21 Sector Tracks:

When backing up a 21 or more sector track, the disk needs the protected track, then writes it out in a special way. When this disk is loaded and run, Happy reads certain data off this disk and loads it into its onboard RAM. It then locks out the enhancement, and away you go.

The disk will behave as an original one, and the data in the RAM buffer takes care of the protection scheme. The backup created by the Happy is not an exact duplicate of the original, only an executable copy, and can be run only on a Happy drive.

Theoretically, this type of backup system will give the user the ability to backup any disk to appear on the Atari market for a long time to come, and maybe forever. And the operation of the program is flawless. I have yet to hear a disk not run in this mode. But what happens if the disk you need to backup cannot be backed up by the Backup program, and there is no POB file for this? You're outta luck. At the time of this writing, I have come across two such programs. They are 'Spy vs Spy II', by First Star, and 'Hardball' by Arcade. Hardball may be backed up using the number 19. There is nothing for 'Spy'. This brings us to the question of how often POB files will be released. As needed? For the type of backup system this is, you have to expect that Happy would issue these files as needed, and quickly. But one usually does not associate the word 'Happy' with anything that happens quickly. I guess we'll have to wait and see.

I asked Happy why it could not make a duplicate copy of all programs on the market today. Especially some programs by Synapse, Electronic Arts, and Paradise. The first two use disks protected by a 34 sector track. 'Akatama Reality' employs a superb protection scheme. This track contains at least 20 sectors, but both the Happy and Duplicator read these as about 18 sector tracks, and that's where we're at. This track drives both the Happy and the Duplicator right up the wall, which is the reason I have not received an accurate sector count. I believe this is what Duplicating Technologies (DT) is referring to when they mention 'weak sector' protection. In addition, a backup copy of 'Akatama Reality' made without a POB file will give you the impression of a properly functioning program when run on a non-Happy drive, although it will not actually operate correctly.

Happy's response was that these tracks are written with a special drive controller and other hardware that could run to over a thousand dollars. I guess anything that Happy says relating to either the performance of their product or a competitor's product must be taken with a pinch of salt. I have not been able to substantiate their claim from an impartial source, either. This may be a true statement, though. The three companies mentioned do market programs that represent such a tremendous leap (21 to 34 sectors) in formatting power it may be quite true that some very special hardware or fir-

mware was employed.

The Happy can back up any type of slow aligned disk. A slow aligned disk has the tracks of a disk laid down in a precise way, and each track is relative to the track before or after it. I have a small program that checks for a slow disk, and this process is timed. If the disk is slow, the time it takes to read these sectors is much quicker than a normally formatted disk.

The Happy backup has a slow alignment routine built into its onboard Operating System chips, enabling back up, no matter how heavy the disk is.

Overall the Happy Rev 7 backup is a success. I don't care how the backup is created, but I guess the bottom line is I have my backup. Such a backup program may go a long way toward stamping our piracy on the Atari. It must be pretty hard for a programmer to offer a quality program at a fair price, only to see drives such as Happy be able to make copies. By at least restricting these illegal copies to a Happy drive only, you have in effect vastly reduced the market for these copies, while still allowing a backup copy to be made. I see more software companies rushing to figure out disk formats, if that is what it takes.

Other Programs

Also in the package are a few other files. One of these makes your Atari DOS 2.0 into a Warp-Speed 2.0. This DOS will now operate at the speed of the Sector Copier. It may also be used with DOS 2.5. I know of there is another program that runs the area from 4C000 to 5CFFF in the computer, and a program that contains the source code for the high speed SMD routine used in the Sector Copier.

Happy vs the Duplicator

This section will deal only with the backup programs available from these companies. At this time the only competition for the Happy on the 1050 drive is the 1050 Duplicator from DT. As it stands, the Happy can backup a 20 sector track without slowing down the drive. Although I've found Rev 2.5 of the Duplicator to have only marginal success in writing a 21 sector track by slowing down the drive, I fully expect further enhancements of the Duplicator's software to make the Happy and Duplicator pretty much even in raw formatting power.

Since I expect the formatting power to be roughly equal, I am looking forward to seeing how DT goes about backing up programs such as Electronic Arts 34 sector track 'On a On a' Happy Computers had to resort to the POB file and running these on Happy drives only. I have promised that by the end of the year they will be able to

copy every piece of software on the market. Then adverts claim these disks will run on any drive. So far, then, we have quite a difference of opinion here by the two companies, eh?

In fairness to DTI, these promises were in regard to their Rev 4 software, and at the moment Rev 3 is not even out. It is claimed that Rev 3 (where available) will copy everything on the market except for a protection scheme employing weak encoding.

They also refer to the Happy operating system as 'antique', and that their operating system had many more routines built-in. What they say is doubtful as two operating systems may be entirely true, and I don't wish to discuss the merits of this. But I would like to make a point.

If you take the Happy board and the Duplexator board and place them side by side, you will find each contains a 6802 CPU and a RAM bank. This houses the operating system chip. This OS chip is nothing more than a software program burned into a chip. Since the only difference here is the program chip, I cannot really see any one board being more powerful than the other. It's the program that counts. Now DTI claim they will succeed, with actually the same hardware, where Happy could not?

There are two reasons why I believe Happy Computers would not allow this

to happen. The first is since the Duplexator was released well before the release of Rev 7, and since Happy was very aware of DTI's claims before release of Rev 7, I cannot believe Happy would allow such a technically inferior program to exist against a Duplexator with the abilities to write 34 sectors/track. I could understand going up against a computer 33 sectors to 21. But no, not 33 against 34.

The second reason is this. As I understand it, most, if not all, of Happy's programming is done by a single person. To me, at least, this guy is the Alan disk drive Magic Man. One of the fastest and most knowledgeable programmers to ever sit in front of the keyboard, he is the creator and developer of this type of board configuration, track buffering, the Warp Speed software, and much more. When one buys a Happy, one is buying more than a custom chip, one is buying a piece of the programmer, a programmer with a proven record of excellence. If there was any way to copy these master tracks, Happy Computers would have pulled it off.

In any respect, it is not hard to pick a winner in this department between the two boards. But the Duplexator does not have to further revisions released yet, so who knows what it will do? How will they backup tracks with 32 or more sectors? Who knows? Only time will tell.

A Computer Prayer

From the Computer
Parables Collection
By Thomas M. Peters

*Oh, OS who art in our
IBM be thy name
Thy system cause
Thy crashes cause
Oh disk as it is in heaven*

*Come into this day, our daily DOS
And forgive us our system errors
In we forgive those who have
erred before us*

*And lead us not into Format
But deliver us from CERNET
For thou art the command
and the errors and the
program server*

I pray!

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STARTING FROM BASICS

by Captain Hacker Part Six

Welcome to the sixth and final episode of Starting From Basics

Up until now I have covered many of the fundamental aspects of programming in BASIC which, although essential if you want to do more than just 'fiddle around with your machine', has probably been rather dull and uninspiring at times! Your knowledge of BASIC should now be at a stage where you are able to understand much more easily the many books and articles available on Atari sound, graphics, and filing systems, but just to start you off in the right direction I will use the last episode to explain some of the more basic graphics of the Atari's graphics commands.

Modes

There are two basic kinds of display format on the Atari, and there are, of course, also variations of each of these types. These are dot modes with various resolutions, or dot size, and character modes with different sized characters. There are sixteen graphics modes available, numbered 0 to 15. You use this number in the GRAPHICS command, i.e. GRAPHICS 2. Let's take a look at the differences between these modes in a little more detail.

Text Modes

Modes 0, 1 and 2 are the only text modes. Mode 0 is the one which the computer sets itself into when you switch it on, and, as you are probably aware, this gives you 40 characters per line, and 24 lines of text. You can only have one colour on the screen at a time with this mode. Although this can be colour for any of the many colours available, Mode 1, however, gives you only 20 characters across the screen, and again it still has 24 lines of text, the characters are elongated. The big advantage though, is that you can have 5 different colours on the screen at the same time! (I will show you how we change colours a little later.) Mode 2 is very similar to mode 1, but there are only 12 lines down the screen giving a much more evenly proportioned character. Once again, five different colours can appear on the screen at once in this mode.

Graphics Modes

Modes 3 to 15 are all dot graphics

modes for drawing on the screen. These are of course one of the main features that make programming on the Atari so interesting for many people. These graphics modes offer a whole range of resolutions and colours, but here lies a small problem! You can have very high resolution (i.e. in GRAPHICS 8) or you can have lots of colours (i.e. GRAPHICS 7 or 11), but you cannot have both.

Why?

Well, the reason is memory. Graphics mode 8 has the highest resolution, giving a screen with 580 dots across and 382 dots down. To store the data for this screen with just the one colour (i.e. each dot, or pixel, either on or off) takes up an astonishing 8138 bytes of memory! When you consider that the Atari eight-bit machines were designed back in the days of expensive memory, it is not difficult to see that it would have proved rather expensive to provide mode 8 with lots of colours.

Invoking Graphics Modes

Enough of the theory, let's try something practical now. Switch on your computer (with BASIC installed), and type the following line:
GRAPHICS 7

You should see the screen go black except for 4 lines on the bottom, where the 'READY' prompt is now printed. This is called the split screen mode, and I will show you later how to eliminate these four lines of MODE 0, but for experimenting, it is ideal. The screen is now ready for you to draw lines on it. Type the following line, but don't worry about what it does for now (all will be revealed in good time):
COLOUR 1

You won't have seen anything happen yet, but now enter the following line:
PLOT 0 0

Now, there should be a tiny dot in the top left hand corner of the screen (imagine that the screen is a piece of graph paper, and that it is labelled 0 to 129 along the top edge (from left to right) and from 0 to 95, along the left

edge (from top to bottom). This is how the screen is laid out, and we plot and draw on it just as we would on a piece of graph paper!

So how do we draw on our graph paper? Well, we use the command DRAWTO. Type the following command:

DRAWTO 50,50

Notice that this draws a line from the position 0,0 to the position 50,50. Remember that we used the PLOT command to plot pixel 0,0, well this left an invisible corner at this location, so that if you used, as we have done, a DRAWTO command it will know where to draw from. Now type this:
DRAWTO 100,0

Which of course draws another line, but this time the invisible corner was left at the location 50,50 by the previous DRAWTO command.

Colours

Now for the tricky bit - playing with colours! Type the following two lines:

COLOR 2
DRAWTO 100,50

The first two lines we drew on the screen were orange, but the last one was green. Try the following two lines:

COLOR 3
DRAWTO 0,50

This time the line is blue, and you should now have three different colours on the screen! As you have seen, we appear to have selected our colours by using the COLOR command, but this however, is not the whole story. For each pixel on the screen, in graphics mode seven, the number 0 to 3 (2 bits in fact) is stored to say which colour it should be. A value of zero is used for the background colour, i.e. a pixel with colour zero is said to be off. These values do not refer to fixed colours, though, since this would be rather limiting to say the least. Instead, they are used to refer to colour registers.

These colour registers contain the colour mixture that is displayed on the screen for each pixel with a relevant colour register value. This facility is

called the PALETTE system, because it is similar to the way an artist might have painted his pictures — he would hold his mixing palette in his hand, and mix only one colour. Four mixing cups in his palette. Consequently for a given painting, (assuming he does not change his palette during the painting!) he can only have four different colours available at a time, but he can mix these four into whatever colours he might want, from his store of paints.

In other words, in mode seven you can have only four different colours on the screen at once (including the background), but you can make them whatever colour you want. The difference between our painted picture analogy and the computer is that you can change the contents of these registers at any time, and that if you do, any pixels on the screen which were plotted or drawn with the corresponding colour register will change instantly to the new colour. You can think of the COLOR command as dipping your imaginary paint brush into a different one of the four palette points, i.e. any further brush strokes (using PLOT or DRAWTO) will use this colour until another COLOR command is issued.

Mixing The Palette

When the graphics seven command is issued, the four registers are set to certain colours. These are referred to as the default colours for mode seven, and they are as follows:

COLOR REGISTER	DEFAULT COLOUR
0	Black
1	Orange
2	Light Green
3	Dark Blue

Suppose, though that you decide that you want to change these colours: how would you do that? You would in fact use the SETCOLOR command. With most television sets, this line don't show their colour very well, so Listing 1 is a short program which will place three wide coloured bars on the screen.

The program attempts to display four colours onto the screen, but, as you can see, there are in fact only 3 showing. This is because the COLOR register zero is the background colour and although this might seem rather pointless it is in fact useful as a way of mixing, or diluting, levels or pixels.

In order to change the colour of one of the registers we must specify three things. These are:

- The register we want to change
- The new colour's value
- The brightness level we wanted

The register value is not quite as straightforward as it should be, since the number used in the COLOR statement

```
PC 30 GRAPHICS 7
PE 30 COLOR 0
ET 30 FOR 140 TO 15
NL 40 PLOT 0, DRAWTO 15,1
IT 50 NEXT 1
FV 40 COLOR 1
RV 70 FOR 140 TO 15
HF 70 PLOT 0, DRAWTO 15,1
IT 70 NEXT 1
FV 100 COLOR 2
DF 130 FOR 140 TO 15
HF 130 PLOT 0, DRAWTO 15,1
FV 130 NEXT 1
FV 140 COLOR 3
FV 150 FOR 140 TO 15
HF 150 PLOT 0, DRAWTO 15,1
BH 150 NEXT 1
```

Listing 1

is not the same value as the number used for that register in the SETCOLOR command! Take a look at Table 1, in the mode 3, 5 and 7 sections and you will see what I mean, for example if you want to change the colour of a pixel, or line drawn using the constant COLOR 1 you will have to use the value of 0 in the SETCOLOR command.

As for the colour value itself, these are shown in Table 2, and as you can see there are 16 basic colours available to you. The brightness level must be an even number from 0 to 14, where 0 is dark and 14 is bright.

By now you probably know enough to be able to change the colours yourself, but in case you are still not sure, here are a few examples for you to try. You should run Listing 1 to put your screen into mode 7 and to draw the thick colour bars on your screen.

Type the following commands, which demonstrate how to change these colours:

SETCOLOR 0,3,4

You should notice the second bar (remember that the first one was drawn in the background colour of black) changes colour from orange to red.

SETCOLOR 0,3,8

This time the colour has not changed, but the brightness has, we now have a bright red bar.

SETCOLOR 1,6,8

SETCOLOR 2,4,6

Now each of the three bars is a different colour, but what about the background? At the moment this is still black, so type the following command.

SETCOLOR 0,10,4

You should now see the whole background change colour. Don't forget that we can use this background colour to plot over other lines on the screen by using COLOR 0.

Take a look at Table 2. Here is a list of colours available to you that you can call using the SETCOLOR command. The colours which actually appear on

Mode or Constant	Default Colours	SETCOLOR Colour Register No.	Colour	Comments
Mode 0 and all text windows	LIGHT BLUE	0	Colour data actually determines character to be printed	—
		1	—	Character luminance (same colour as background)
		2	—	Background
		3	—	—
Mode 1 and 2	BLACK	4	—	Border
		0	Colour data actually determines character to be printed	—
		1	—	Character
		2	—	Character
(text modes)	LIGHT GREEN	3	—	Character
		4	—	Background, border
		0	—	—
		1	—	—
Modes 3, 5, and 7 (four colour modes)	DARK BLUE	2	—	—
		3	—	—
		4	—	—
		0	—	—
Modes 4 and 6 (two-colour modes)	BLACK	1	—	—
		2	—	—
		3	—	—
		4	—	—
Mode 8 (1 colour, 2 luminances)	LIGHT BLUE	0	—	—
		1	—	—
		2	—	—
		3	—	—
Mode 9 (1 colour, 2 luminances)	DARK BLUE	0	—	—
		1	—	—
		2	—	—
		3	—	—
Mode 10 (1 colour, 2 luminances)	BLACK	0	—	—
		1	—	—
		2	—	—
		3	—	—

Table 1. Mode, Register, Color

your screen may differ somewhat from those in the table, but this is quite normal, as television sets do vary, particularly as you vary the brightness of the colour.

The other graphics modes (3 to 6) operate in the same way as mode 1, except that the number of pixels per screen (the resolution) will vary, as will the number of colours you are able to have on the screen at one time.

Colours	Selector Numbers
GREY	0
LIGHT ORANGE (GOLD)	1
ORANGE	2
RED-ORANGE	3
PINK	4
PURPLE	5
PURPLE-BLUE	6
BLUE	7
SLUE	8
LIGHT BLUE	9
TURQUOISE	10
GREEN-BLUE	11
GREEN	12
YELLOW-GREEN	13
ORANGE-GREEN	14
LIGHT ORANGE	15

Table 2: The numbers

The Text Modes

Modes 1 and 2 are the two large text modes. With these modes all five colours can be used, but they are not selected using the COLOR command. Instead, the case and inverse video selection of letters decide which colour the characters appear as. Confused? We'll let me explain.

Type GRAPHICS 1. Now comes the problem, for if we use a normal PRINT command to print a string, it will appear in the bottom four lines of the screen, in the small mode 0 section. To print a word into the mode 1 section you must use the following format:

PRINT #6,"ATARI"

You need not concern yourself with the reason for this, but if you are interested, it is because the operating system opens the display as it would open a file, and it uses channel six to do so. So how do we print using a different colour?

Try entering the same command, but this time enter the word "Atari" in lower case letters. Now you should see it printed in a different colour, but still in upper case. Enter the same command once again, but this time enter the word ATARI in upper case and inverse video. You should see the word ATARI printed in yet another colour, (but once again it will be in upper case - and normal video). And last, but not least, try the command with the word "Atari" printed in lower case and inverse video. The fourth colour should now be on the screen.



You can now change these colours, just as you did with the mode 7 text, using the SETCOLOR command. You should now be experimenting with each of the graphics modes. Take a look at Table 3, where you will see mode 3 to 6 listed with their relevant COLOR, SETCOLOR statements and default colours.

Getting a Full Screen

Although by default the graphics screens have 4 lines of mode zero text, these can be eliminated by simply adding 16 to the mode number - i.e. GRAPHICS 7+16. If you let a program

STOP, however remember that the operating system will clear the whole screen to mode zero so this BASIC can print the "READY" message!

And Finally

By now, hopefully, you will have grasped the concept of the Atari's colour system. Armed also, with the help of this series, with a good grounding in ATARI BASIC (if not, then buy your book soon, quickly!) you should now be able to investigate the vast possibilities available with your ATARI home computer. Here's wishing you lots of luck, and many hours of fun.

SCREEN FORMAT

Graphics Mode	Mode Type	Columns	Rows - Split Screen	Rows - Full Screen	Number of Colours	RAM Required (Bytes)
0	TEXT	40	-	24	5-12	592
1	TEXT	20	20	24	5	674
2	TEXT	20	12	12	5	424
3	GRAPHICS	40	20	24	4	434
4	GRAPHICS	60	40	48	2	554
5	GRAPHICS	80	40	48	4	1174
6	GRAPHICS	160	60	96	2	2174
7	GRAPHICS	160	60	96	4	4190
8	GRAPHICS	320	160	192	1-13	8112
9	GRAPHICS	40	-	160	1	6138
10	GRAPHICS	80	-	160	8	6138
11	GRAPHICS	80	-	160	16	6138
12	GRAPHICS	40	20	24	5	1154
13	GRAPHICS	40	10	12	5	664
14	GRAPHICS	160	160	192	2	4270
15	GRAPHICS	160	160	192	4	8112

Table of modes and screen format

ATARI
ST/STE

COMPACT DISC PROGRAMS
ST/STE - 5, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600, 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1160, 1180, 1200, 1220, 1240, 1260, 1280, 1300, 1320, 1340, 1360, 1380, 1400, 1420, 1440, 1460, 1480, 1500, 1520, 1540, 1560, 1580, 1600, 1620, 1640, 1660, 1680, 1700, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980, 2000, 2020, 2040, 2060, 2080, 2100, 2120, 2140, 2160, 2180, 2200, 2220, 2240, 2260, 2280, 2300, 2320, 2340, 2360, 2380, 2400, 2420, 2440, 2460, 2480, 2500, 2520, 2540, 2560, 2580, 2600, 2620, 2640, 2660, 2680, 2700, 2720, 2740, 2760, 2780, 2800, 2820, 2840, 2860, 2880, 2900, 2920, 2940, 2960, 2980, 3000, 3020, 3040, 3060, 3080, 3100, 3120, 3140, 3160, 3180, 3200, 3220, 3240, 3260, 3280, 3300, 3320, 3340, 3360, 3380, 3400, 3420, 3440, 3460, 3480, 3500, 3520, 3540, 3560, 3580, 3600, 3620, 3640, 3660, 3680, 3700, 3720, 3740, 3760, 3780, 3800, 3820, 3840, 3860, 3880, 3900, 3920, 3940, 3960, 3980, 4000, 4020, 4040, 4060, 4080, 4100, 4120, 4140, 4160, 4180, 4200, 4220, 4240, 4260, 4280, 4300, 4320, 4340, 4360, 4380, 4400, 4420, 4440, 4460, 4480, 4500, 4520, 4540, 4560, 4580, 4600, 4620, 4640, 4660, 4680, 4700, 4720, 4740, 4760, 4780, 4800, 4820, 4840, 4860, 4880, 4900, 4920, 4940, 4960, 4980, 5000, 5020, 5040, 5060, 5080, 5100, 5120, 5140, 5160, 5180, 5200, 5220, 5240, 5260, 5280, 5300, 5320, 5340, 5360, 5380, 5400, 5420, 5440, 5460, 5480, 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700, 5720, 5740, 5760, 5780, 5800, 5820, 5840, 5860, 5880, 5900, 5920, 5940, 5960, 5980, 6000, 6020, 6040, 6060, 6080, 6100, 6120, 6140, 6160, 6180, 6200, 6220, 6240, 6260, 6280, 6300, 6320, 6340, 6360, 6380, 6400, 6420, 6440, 6460, 6480, 6500, 6520, 6540, 6560, 6580, 6600, 6620, 6640, 6660, 6680, 6700, 6720, 6740, 6760, 6780, 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10100, 10120, 10140, 10160, 10180, 10200, 10220, 10240, 10260, 10280, 10300, 10320, 10340, 10360, 10380, 10400, 10420, 10440, 10460, 10480, 10500, 10520, 10540, 10560, 10580, 10600, 10620, 10640, 10660, 10680, 10700, 10720, 10740, 10760, 10780, 10800, 10820, 10840, 10860, 10880, 10900, 10920, 10940, 10960, 10980, 11000, 11020, 11040, 11060, 11080, 11100, 11120, 11140, 11160, 11180, 11200, 11220, 11240, 11260, 11280, 11300, 11320, 11340, 11360, 11380, 11400, 11420, 11440, 11460, 11480, 11500, 11520, 11540, 11560, 11580, 11600, 11620, 11640, 11660, 11680, 11700, 11720, 11740, 11760, 11780, 11800, 11820, 11840, 11860, 11880, 11900, 11920, 11940, 11960, 11980, 12000, 12020, 12040, 12060, 12080, 12100, 12120, 12140, 12160, 12180, 12200, 12220, 12240, 12260, 12280, 12300, 12320, 12340, 12360, 12380, 12400, 12420, 12440, 12460, 12480, 12500, 12520, 12540, 12560, 12580, 12600, 12620, 12640, 12660, 12680, 12700, 12720, 12740, 12760, 12780, 12800, 12820, 12840, 12860, 12880, 12900, 12920, 12940, 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VIDEO DIGITISER REVISITED

by Martin Bann

Way back in Issue 10 of *Monitor*, details were given of a Video Digitiser, designed by Mark Bingham, that was subsequently published in the December/February edition of *Electronics* - The Magpie Magazine. The design of the digitiser itself was excellent but the only problem with it was that it required a computer that had one input and one output port. This clearly suits the old 400/800 Atari computers as the four joystick ports provide just what is needed. Unfortunately the newer XL and XE range only possess two such ports, thus the owners of these machines are deprived of the fascinating possibilities of digitised pictures, (at least for Mark's design anyway!).

Don't despair! XL/XE owners, all is not lost! In Figure 1 I have shown a circuit that will enable any computer with just two joystick ports to be used with the digitiser. The ports are set up as input ports and a byte is sent to a specific

memory location, which enables the circuit connected to the computer's data bus. The circuit will read and store this byte, which would then be passed on to the inputs of the two 74HC167's. The digitiser would then function as normal, i.e. instead of sending the 'position byte' to the output port you send it to a specific memory location, the circuit does the rest.

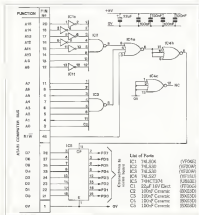
When the address on the computer Address Bus is 1791 (dec), 06FF (hex), 0000 0110 1111 1111 (binary), the outputs of IC2 and IC3 will go low. When the RW line goes low, i.e. the CPU is in the write mode, the output of IC4a will go high. This is inverted by IC4b which sets pin 11 of IC5 low. During the process the computer would have set up the Data Bus to the levels determined by the data poked into the memory location 1791 (dec). Therefore, the inputs of IC5 will be at the correct levels. When the signal on pin 11 of IC5 goes low it will transfer the data at it's



input to it's internal registers. When pin 11 then goes high, through the computer setting up a different address, IC5 will transfer whatever data is in it's internal registers to it's output pins, these pins being connected to the input port of the digitiser. Any subsequent Data Bus changes occurring will not affect the output signals on IC5, until pin 11 goes low then high.

The only changes to the machine code listing shown in the original article are that the label in line 30 called PORTB should be given the new address of 06FF (hex) and lines 50, 530, 610, 620 and 640 are deleted.

Figure 2 shows the connector in the back of the Atari computer, viewed looking into the back. You will need a suitable connecting socket and Magpie Electronics have one available under the part number PG23A. It will need to be cut to the required length however. The blank position on PG23A can be ignored as positions 43 and 42 on the Atari edge



HOT GOSSIP

Nine plus Four

Level 9, the well-known adventure wizards, have signed a contract with national authors, Delta 4, for a special adventure to be published next Easter. One of Delta 4's best known works is 'Board of the Rings', but the title and subject of the new adventure is being kept secret until after Xmas.

Red Rat do it Again!

Following closely on the heels of their new releases *Lost Hawk* and *Domain of the Undead*, Red Rat are bringing out two new games in December. The first is *Kungai from Doomworld* in which 3 leading Earth scientists are held captive by play-uglies on Doomworld, and they must be rescued before their knowledge can be used against all of humanity. It is claimed to be '5 arcade games in 1' and will retail for £25.95 on disk or £3.95 on tape. The second release is 'Space Gunner' which is a 'rave spaceship' with sci-fi theme type arcade game. Retail prices are £4.95 for floppy or £2.99 for cassette.



It's all in the Mind!

The Mind Tuner is a 'unique program that uses proven psychological principles to help manage stress, and to improve personality and performance. It is a simple and effective tool for self-improvement and uses visualizations, positive affirmations, and subliminals to get your subconscious to work for you.' Well that's what Mind Link

Communications Inc. claims for their product. Who are we to dispute them. If you have a 486 8-bit Atari computer with a disk drive and this is of interest to you, you can get more information from the need company at Box 468, 36 Adelaide Street East, Toronto, Canada M5C 2A5. P.S. the price is around \$25 Canadian.



Musical Interlude

2 Bit Systems have announced two new programs for the 8-bit Atari and a professional sound sampling system for the ST. One of the 8-bit programs is a 16 track sequencer for use with MIDI-Master MIDI interface. The other is DigDrum II which features 9 sampled sounds, all drums sampled at 16KHz, pull down windows, 2 drum polyphonic and no extra hardware is needed.

ST Replay Plus features variable sample rates, samples played through your TV or Hi-Fi connection via the cartridge port. The software consists of the R2 play sampling system which includes editing, waveform display, reverse and trigger options; ST-Digidrum which is a high quality polyphonic sample sequencer; ST-Echo which is a digital echo program for your special effects; and in addition you can load samples into your own Basic programs. ST Replay Plus costs £89.95.

Musicals from Microdeal

Look out for two new superb programs from Microdeal. Shuttle II is a true to life shuttle mission to retrieve a faulty communications satellite; that you can enjoy from the comfort of your own armchair. First you play the Mission Controller, deciding on the launch position, the effect of winds, an entry trajectory, which runway to land on, etc. Then you become the shuttle pilot and try to guide your ship through its mission. Available on ST disk for £24.95.

Karate Kid II will probably turn out to be a classic. On the ST, Advanced publicity photos of some screens from the game were shown at the PCW show and they stopped everybody in their tracks. You can miss every other program that's around, but don't miss this one!



MONITOR ON DISK

Like the look of a program but can't find the time to try it? You've asked it with three times to do it for you until you're out at work, and it'll tell you. Or maybe you have typed it in but haven't run, then why not tell all the effort out of it and ask for the MONITOR DISK. All the main programs in each issue of MONITOR are now available on 5.25-inch disks for you. They cost £14.95 (which includes postage and packing, and a charge for postal order made payable to the "U.K. Adm-Computer Owners Club") to Monitor Magazine. P.O. Box 3, Rayleigh Essex. If you live in Europe add 50p. If outside Europe add £1.00. Please allow 28 days for delivery.

Monitor Disk 8

Includes: *Quikplot*, a fast Graphics R Plot/Drawing facility. *Nightmare Reflections*, an exceedingly frustrating adventure. *Matchbox*, improve your concentration with this memory game. *Intermap 5* demo program showing various uses of intermap.

Monitor Disk 9

Includes: *Kayjo*, a new typing challenge. *Mailbox* (Booths): database program for

Mailbox disks. *Balok*, binary loads from BASIC. *Phagepro*, automatic file transferring. *Remind*, for use with the 1000K Post File, a speedy shape filling utility.

Monitor Disk 10

Includes: *3D Maze*, escape from the maze as freely you can. *PCB-Paint*, draw your own icons before they get you. *Disk Jacket*, useful program for making your own disk covers. *Chess*, an excellent game, not to be missed.

Monitor Disk 11

Includes: *Hexadecimal Code Generator* better presentation for your programs. *Cracktable* Code, seven more programs from the series (R&M) Tables, with a little bit of hardware and the program, you can test your own code. (at 400/800-words) Bonus Program: *HornerM*, a useful utility for use with *Hex File Manager* to give quick access to data disks.

Monitor Disk 12

Includes: Another *Boring Space Invaders* Clone, unless its name suggests the game is nothing good and lots of fun. *Get Married*,

two programs for use with the circuits described in this interesting article. Mail advertising: can you escape in one year? *Cracking the Code*, BASIC being and assembler code for a drawing program. *Opening Out*, five useful programs for disk drive access.

Monitor Disk 13

Includes: *Demon*, the Baron's demon has escaped and it's after you! *Phagepro*, BASIC virus source code listings for page flipping techniques. *Cracktable* Code, BASIC and source listings for player/monster movement. *Adventure Column*, data compression programs. Bonus Program: *Pringo*, excellent BASIC version of the well-known Pong game.

Monitor Disk 14

Includes: *Deathzone*, superb action game in which you must kill the alien gods and escape from the Deathzone. *Cracking the Code*, display list programs in BASIC and source code. *Adventure Column*, conflict sentence analyzer program. Bonus program: *Monoway*, novel plot machine simulation but with a mysterious theme.

BACK ISSUES

Previous issues of this magazine are obtainable from the club for £12 plus 50p postage each. They contain many interesting and informative articles. Hint & tip, programs, listings for you to input, reviews and practical advice. If you have missed out on any of your copies of back issues today? Please note that issues 1, 2, 3, 4, 5 & 7 are already sold out.

Issue 6

Includes a useful tutorial showing how to plot Micropoints and Vintawriter pictures also contains a terrific program demonstrating 80 characters across the screen. A new regular column for adventure enthusiasts started to give reviews of adventure games and give hints and tips on how to play them. First issue of *Cracking the Code* continues with address/wordcode and binary code. The hardware design for a Light Pen is shown together with some simple programs use with it once you have built it. Fun with Art from *Once Upon A Time* and some of the excellent results of using this package are shown. Programs include *Placation* and a RTTY listing for use with a short wave hand radio (the Alan-840 microphone and a signal terminal unit) such as the Maplin TL10002.

Issue 8

Contains a preview of the new Atari computers. Two new games start out about how this work and the other "Stealing from Basics" for beginners. *Cracking the code* continues and concluding part of "Intermap" discussion horizontal and vertical scrolling. The adventure column includes reviews of *Maid of the Sun* and *Saucer*. Other reviews include *Canary*, *Eye Eye*, *Alley Cat* and *Chessmate*. Programs are *Matchbox*, a concentration game. *Quikplot*, a Graphics R Plot/Drawing facility. *Nightmare Reflections*, an exceedingly frustrating adventure.



Issue 9

Includes a *WANDER* for the 1000K as well as a review of this excellent reactive Introduction to MIDI, just what is it? KEYD typing checker program. Utility to give binary load files from *Rem*. Review of *TopCob*, *Hornerword* and *HexCO* Overview of *FORNIT* as an alternative to *Basic*. Utility to fill in shapes in *Graphics R* and test tool *Profile* on *Low Valley Area Club*. *HAPPY TWICE* gives automatic file numbers and programmable function keys. Utility for indexing *Mailbox* disks.

Issue 10

Includes all the facts about *Digital Pictures*. *Disk Jacket*, a new program for making your own disk covers. *Opening Out*, more about how this work. Review of the Great American Road Race. *Kennedy Approach*, *Red Moon*, *Asphar* and *Webfinger*. Two adventure games. *PCB Paintbox* and *3D-Maze*. Introduction to the world of communications. Continuation of regular: *Cracking the Code*. Starting from *Basics* and *What's MIDI?*

Issue 11

Includes *RAM Teller* for 400/800 machines. Review of *Atariwriter Plus*. *Saboteur*, *Kennedy Riff*, *Deathgale*, *Merrimay*, *Flight Plot*, *Gazette* and *Alarm*. *Really*, *ST MIDI* programs and *ST Jean Hat*. *Hexadecimal Code generator* and some book reviews. Plus *Starting from Basics* and *Cracking the Code*.

Issue 12

Includes: *Get Married*, add-on circuits for various routers. Another *Boring Space Invaders* Game (but it isn't), *Testing that bit*. Part 3 of *Opening Out* discusses disk file handling techniques. Recall of about *Netbox* and *Amey*, and the adventure column shows how to write your own adventure. *Rift* reviews include *Technicolor Dream*, *Edibles* and *Action Bikes*. *ST reviews* include *DB Master One*, *Time Bands* and *Maze Plus*.

Issue 13

Includes: *Geometric* and *Utterson* compared, are they really the same? In-depth review of *Super 3D Plotter II*. Data compression techniques for video stores. *Graphics R* page flip program. *Magnetics C* and *Latitude C* evaluated. Tempering the sword on your 8-bit Atari. *Cracking the Code* discusses programmable graphics. *Demon*, the Baron's terrible evil spirit is after you! 8-bit reviews include *Placation*, *Pringo*, *Maplin Low Valley* and *Matchbox*. *ST reviews* include *Commerce*, *Cards* and *Major Motion*.



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